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FIGURES AND DESCRIPTIONS

OF THE

PALÆOZOIC FOSSILS

OF

CORNWALL, DEVON, AND WEST SOMERSET;

OBSERVED IN THE COURSE OF

THE ORDNANCE GEOLOGICAL SURVEY
OF THAT DISTRICT.

By JOHN PHILLIPS, F.R.S., F.G.S., &c.
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Late Professor of Geology in King's College, London.

PUBLISHED BY ORDER OF THE LORDS COMMISSIONERS OF
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NOTICE.

It having been represented to the Lords Commissioners of Her Majesty's Treasury, by the Director of the Ordnance Geological Survey, that in connexion with the Report and Maps of the Survey of Cornwall, Devon, and West Somerset, it would be desirable that the Organic Remains of the Older Rocks observed in the course of that Survey, should be carefully examined, figured, and described, their Lordships were pleased to order that such examination should be made and the result published, and Mr. John Phillips, F.R.S., &c., was appointed to execute the work, which is now printed uniformly with the Report on the Geology of the same district, by Henry T. De la Beche, F.R.S., &c., Director of the Geological Survey.

PREFACE.

HAVING received instructions from the Lords Commissioners of Her Majesty's Treasury, to examine and describe, for the purpose of publication, the organic remains of the older strata of Cornwall, Devon, and West Somerset, which had been observed in the course of the Ordnance Geological Survey of the district, I was immediately furnished by the Director of the Survey with abundance of materials for study, and references to private collections and localities in the district.

On reviewing the means thus provided for the preparation of the general description contemplated in the instructions, it appeared necessary for me to visit a considerable number of localities in Devonshire and Cornwall, in order to ascertain facts regarding the distribution of the organic forms already collected, and if possible, by scrupulous research, to augment the number of species.

The indefatigable researches already made in the very fossiliferous regions of South Devon, at South Petherwin, and about Barnstaple, left to Mr. De la Beche and myself little hope of making important additions, except by a minute scrutiny of new localities, chiefly in North Devon. Desirous, however, of making as good an examination as possible in the district, I prevailed on Mr. William Sanders to accompany me, and aid me with his experience and perseverance; and to this excellent friend I am indebted for the most zealous and disinterested assistance. In some situations we derived much advantage from drawing on the spot specimens which, from the disintegrated condition of the stone, could not be removed entire. After collecting the specimens at home, it was found possible, by *making casts* in the cavities left by shells and corals, and by *splitting* some of the specimens parallel to their stratification, to determine several interesting forms.

In addition to the collections made in the course of the survey, and of the subsequent examination just noticed, there were placed at my disposal, through the applications of Mr. De la Beche, a splendid series of fossils, chiefly from the calcareous strata of the vicinity of Newton Bushel, the fruit of the personal exertions of Mr. Austen during his residence at Ogwell House: an excellent suite of Petherwin fossils collected by Mr.

some other fossils of the South Devon Coast, (the gift of Mr. Harvey of Teignmouth). From another friend and fellow-labourer on the Geology of the North of England, Mr. J. E. Lee, I had received accurate drawings and local information, the result of his residence at Torquay; and from his numerous acquisitions in that vicinity I have lately drawn many and valuable data. I found in the cabinet of the Natural History Society at Plymouth some specimens of interest, and lately Mr. Drury of Exeter has favoured me with the sight of some of the Goniatites which have been found near that place.

I had the good fortune to obtain (in 1836) a rapid glance at a part of the collection made with uncommon perseverance, at Plymouth, by the Rev. Richard Hennah, and afterwards (in 1840) saw, with attention, another portion of this unique and valuable series, the greater part of which was then placed by its liberal owner in the hands of Professor Sedgwick and Mr. Murchison, for the purpose of completing the list of Devonian fossils which they have given in the Geol. Trans., New Series, vol v. These distinguished geologists have shewn me the specimens which they had collected in the Eifel, on the Rhine, and in Devonshire, and have on all occasions manifested the most friendly interest in the objects I have proposed to accomplish.

From these various sources have been derived the data embodied in this work. Though extensive, they are not complete. Mr. Hennah's collection is still only partially known to me. Neither Mr. Austen's nor Mr. Lee's drawers are quite exhausted; many new forms are among Mr. Williams's specimens, and many others pro-

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own drawings were inevitably but outlines, and in other cases the imperfection of the specimens was too great to allow of other than coarse representations.

The descriptions in like manner convey my impressions from the sight of the objects, except in a very few cases where the original author is quoted, or where, from imperfection of specimens, or doubt of the limits of specific character (as in *Terebratula pugnus*, No. 156), it has been thought useless to incur the risk of error. It would be presumptuous to offer these 'Characters' as completely diagnostic (the true notion of specific characters in recent zoology and botany), because in a fossil state we seldom meet with specimens in such abundance, in such perfection, in such various states of growth, or conditions indicative of past existence, as to render this possible.

Even among living objects, where we may see individuals of all ages, and under every variety of external influences, the exact definition of a 'Species' is perhaps impracticable, except in the instances where the circle of analogies, in which most forms and structures are bound, is broken: how seldom then ought we to affirm confidently in regard to fossils, from a few individuals of unknown age and circumstances of life, what are the natural limits of the species.

Those who look carefully into the history of ancient organizations, find it necessary to lay aside ideal abstractions, and to look out for resemblances and differences of structures. Among strata of different age, occur different *combinations* of forms, and differences of *individuals*. Strata of the same age, explored at distant points, or composed of a different sort of mineral matter, shew, both in the *combinations* and in the *individual* forms of fossil remains, the influence of local physical agencies: whether in any given case the local influence of conditions, or the general influence of successive time (which appears to have been accompanied by successive general physical changes), shall be found predominant, is a question to be decided by evidence, not prejudged by hypothesis. But on whatever governing cause the differences of individual structures observable in a fossil state depend, and however numerous the terms or steps in the series of these structures, the distinctions which do appear amongst them (whether they be supposed specific or not) have a positive value in reasoning, lead to definite results, and deserve definite names.

Proceeding upon this principle, I have given or applied names to 277 animal structures in the Palæozoic strata of the district under review, and in illustration of these about 750 figures (including magnified parts) have been found necessary. If to these were added the speafter the descriptions of fossils, were framed with no particular regard to the opinions which have been presented by different geologists, concerning the age and analogies of the strata of North and South Devon,* but purely as the natural results of a simple arrangement and contemplation of the phenomena. The numerical *proportions* on which some of these inferences depend, may, perhaps, not be materially changed by subsequent additions to the catalogue; but, convinced of the necessity of making conclusions of this nature rest on a wide basis, I have added some notices of localities, which, if well searched by diligent hands, may probably yield good fruits.

The length of time which has elapsed since this investigation was entrusted to me, may be in some degree a guarantee for due attention on my part; but this is not the only reason of the delay. The manner in which a large part of the specimens have been received at different times from distant friends, even up to the very hour of publication, has necessitated, more than once, a remodelling of a great part of the descriptions; and there is, besides, in the acknowledged incompleteness of a considerable proportion of the fossils of the district, an obvious antidote to hasty decision regarding their analogies. Perhaps what is here done may contribute, if combined with the zoological labours of Mr. Lonsdale, Mr. Sowerby, and Mr. Austen, and read in connexion with the geological works of Mr. De la Beche, Mr.

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* *See* the luminous abstract of these views prefixed to Mr. Lonsdale's valuable 'Notes on the Age of the Limestones of South Devonshire,' (Geol. Trans., 2nd Series, vol. v., p. 721).

Murchison, and Professor Sedgwick, to a partial removal of the veil which has long obscured the age and affinities of the strata of Devon and Cornwall; but it must ever be remembered, that conclusions from limited data can have but limited application, and are liable to correction from more enlarged research; and that the most certain local truths require to be cautiously and philosophically combined before they can stand for large areas, or be adopted in the foundation of general arguments.

DESCRIPTIONS OF THE FOSSILS,

With Reference to the Plates.

	Plates		Plates
Polypiaria	1 to 13	Gasteropoda	36 to 39
Crinoidea	14 to 16	Cephalopoda Monothalamacea	40
Conchifera Plagimyona .	17 to 19	———— Polythalamacea	41 to 54
———— Mesomyona .	20 to 23	Crustacea and Fishes . . .	55 to 57
———— Brachiopoda .	24 to 35	Supplemental	58 to 60

POLYPIARIA.

Genus. TURBINOLOPSIS.

Etym. A compound of Turbinolia and ’οψις—facies.

Syn. Turbinolia. *Lamouroux*, Expos. Method. des Genres des Polyp.

Turbinolopsis. *Lonsdale*, in Murchison's Sil. Researches.

Petraia. *Münster.* As quoted by *Lonsdale*, in Geol. Trans., 2nd Series, vol. v. part 3.

Character.—Animal unknown.

Polypiarium unattached, undivided, conical, deeply concave (hypocrateriform) on the lamelliferous surface. Lamellæ denticulated on the edges, plain on the sides, alternately long and short. External surface more or less striated longitudinally in correspondence with the lamellæ, and marked by annular lines of growth.

The very remarkable abundance of fossils of this genus in the older strata renders it important to know accurately the structure of the coral, so as to be able to determine the analogies of the animal. In the single unattached mass and denticulated lamellæ of unequal lengths we see the closest analogy with Fungia and Turbinolia (with the latter of which they have been commonly united); while the deeply concave lamelliferous disk, and the absence of horizontal septa, seem to give generic peculiarity. The lamellæ are not granular on their sides.

A species of the genus now before us was ranked by Lamouroux among the Turbinoliæ. Mr. Lonsdale has adopted the name of Turbinolopsis, which had been employed by Lamouroux for a coral of Caen, thought by Blainville not to merit generic distinction. In his List of Devonshire Fossils (Geol. Trans. 2nd Series, vol. v.) this author has quoted Count Münster for the new designation Petraia; but in the Beitrage published by the Count in 1840, this is ranked as a genus of Gasteropoda.

Two species have been described, *viz.*—

Turbinolia celtica. *Lamouroux.* From Kerliver, near Faon, Department de Finisterre.

Turbinolopsis bina. *Lonsdale.* From many localities in the Ludlow, Wenlock, and Caradoc Rocks.

The fossil from North America, figured by Goldfuss (pl. 13, fig. 2), under the name of *Anthophyllum denticulatum,* appears very like a cast of the internal lamelliferous surface, the base upwards, of a third species of this genus.

It is somewhat remarkable, in regard to the distribution of this group, that so large a proportion of the specimens has been found in the older argillaceous strata, and very few in the limestones, which, on the other hand, yield by far the larger proportions of Favosites, Cyathophylla, Porites, Amplexus, Astræa, &c. On this account the preservation of the specimens is not so good as might be desired. The calcareous substance is wholly removed in almost every instance, leaving a sulcated and punctated cast (conical, hemispherical, or truncate) enclosed in a conical striated cavity. The internal cast, which is very characteristic, has been founded under the title of *Turbinolia fungites,* and occurring in the mountain limestone, there is no appreciable generic difference. On pl. 1, fig. 3 A, are drawings of such a young specimen of *Turbinolia fungites,* and of the cast in its deep interior cup. It has 48 lamellæ, of which 24 are almost marginal, and the others collect variously to a *central line*; all are denticulated, so as to leave pits in the grooves of the cast; the external surface is nearly smooth, hardly at all striated lengthways; the general figure is obliquely conical, or arched. In old specimens horizontal septa appear, and this is perhaps not the case in Turbinolopsis.

In the following descriptions, the diameters and axes of the conical figures belonging to the species, are compared by expressing the measures of them in millimeters. The specimens being very often compressed, the longer and shorter diameters of the elliptical section are represented by D and *d;* the axis of the cone is denoted by A.

1. TURBINOLOPSIS CELTICA, *pl.* 1, *fig.* 1.

Ref.—Turbinolia celtica. *Lamouroux,* loc. sup. cit., *pl.* 78, *fig.* 7, 8.

Character.—General figure elongate, conical, with the aperture dilated (more or less oblique), *very deeply* excavated.

External surface marked by concentric lines of growth, and (generally) smooth longitudinal striæ, 40 to 48 in number.

Internal surface conspicuously ribbed by 40 to 48 prominent radiating lamellæ, equally denticulated on the edges, but of unequal length, the alternate ones being shorter (centre sometimes twisted).

The cast of the interior cavity is a generally oblique, conical mass of the stone in which the coral was imbedded, obtuse towards the apex, and marked by 40 to 48 deep narrow grooves, half of which cease on reaching the obtuse part of the cone, where the others become extremely deep. In some specimens (South Columb) these grooves shew no traces of the denticulations of the lamellæ; in others (South Petherwin), the impressions of the lamellar serratures appear like transverse short grooves and ridges. In the former, the secondary lamellæ perhaps approach nearer to the apex of the cone, but these distinctions appear unimportant, or due to accidental variation.

Size of a large compressed specimen, D. 30; A. 35.

Localities.—In Cornwall: South Petherwin (40 lamellæ); St. Columb (44 lamellæ); Polruan; Fowey.

In South Devon: Combe (40 lamellæ); Mudstone Bay (40 lamellæ); Torquay (48 lamellæ); Yealm.

In North Devon: Brushford (48 lamellæ).

Lamouroux has figured (*loc. sup. cit.*) a cast of the interior of what seems, by the section which he gives, to be of this species. The number of double grooves is 21, or 42 in all. The lateral view of the specimen in M. Lamouroux's plate is so shaded as to convey the notion that each of the 42 ribs is again divided by a sunk line. There is no mark or mention of puncta in any of the grooves; but this may be accounted for by the state of conservation usual in slaty rocks. There are concentric undulations, as in *T. pluriradialis,* and most others of the genus, occasionally.

2. Turbinolopsis bina, *pl.* 1, *fig.* 2.

Ref.—Turbinolopsis bina. *Lonsdale,* in Silurian Researches, p. 692; *pl.* 16, *bis*, *figs.* 5, 5 *a.*

Character.—General figure, conical.

External surface longitudinally striated, and concentrically lined.

Internal surface very deeply excavated, ribbed by about 24 or 32 thin lamellæ, alternately longer and shorter, all boldly denticulated on the edge; the intermediate broad grooves having in the middle a slightly elevated finely punctated line.

The conical cast of the inner surface shews, in its deep narrow grooves, the impression of the denticulated edges of the lamellæ; and on its broad ridges, a mesial furrow, with a row of fine elevated granulæ. The number of these elevated granulæ, as compared to the denticulations of the lamellæ, is about as 3 to 2. Each of them appears to have a small depression in its centre. The lamellar denticulations, in specimens very well preserved, are clearly *impressed* on the cast.

Size of a compressed specimen, D. 9; *d.* 7.

Mr. Lonsdale's figure and descriptions, in the Silurian Researches, represent the usual appearance of the internal cast of this species very satisfactorily.

Locality.—In South Devon: Combe, near Ashburton.

3. **Turbinolia fungites**, *pl.* 1, *fig.* 3. *a*, referred to p. 3.

4. **Turbinolopsis pauciradialis**, *pl.* 1, *fig.* 4.

Character.—General figure obtusely conical, the apex attenuated.

External surface concentrically striated.

Internal surface deeply excavated, ribbed by above 20 acute thin lamellæ, very finely denticulated on the edge, and the greater number reaching to near the centre: the intermediate broad grooves are divided, longitudinally, by a low obtuse ridge.

In the cast, the contrast between the sharp slit left by the lamellæ, and the obtuse sulcus left by the low intermediate ridges, is remarkable. Without care, the marks of the fine denticulations of the lamellæ might not be perceived. They are also sometimes filled with stony matter, which projects, so as to mislead the observer into the notion of their being elevated puncta on the cast. On the broad ridges which represent the grooves of the inner surface are two elevated serrated lines, seldom clearly seen.

Size of a compressed specimen, D. 16; *d.* 12; A. *in cast,* 13.

Locality.—In North Devon: Corffe quarry, near Tawstock.

5 *α*. **Turbinolopsis pluriradialis**, *var. α*, *pl.* 2, *fig.* 5 *α*.

Character.—General figure obtusely conical, the apex attenuated and curved, very deeply excavated.

External surface marked with 70 to 80 faint longitudinal undulations; crossed by concentric lines of growth.

Internal surface ribbed by 70 to 80 lamellæ, alternately longer and shorter, crossed by a few concentric undulations and numerous lines of growth; a row of pores in the intermediate grooves.

In the cast the lamellæ are represented by grooves, which are uncommonly deep towards the centre, and shew a few traces of serratures on their sides, and a line of (elevated) puncta on the intermediate ridge.

Only a few specimens have been seen, all from North Devon. In one of these appear clear traces of a tendency in the star to divide into two parts, by fissiparism, commencing near the centre. —*See* pl. 1, fig. 5, *b* and *d*.

Similar facts may be noticed on specimens of other species of this genus.

Size.—D. 20; length of cone, 25; A. 16.

Locality.—In North Devon: Brushford; Linton.

5 β. Turbinolopsis pluriradialis, *var.* β, *pl.* 2, *fig.* 5 β.

Character.—(*Young*).—General figure an obtuse cone. Internal surface boldly ribbed with about 48 lamellæ, equal near the edge, and equally denticulated, but of unequal length; half of them terminating at the base of the steep internal sides of the cup. The lamellar denticulations very prominent, bold, and equal.

On the cast, which is an obtusely conical or *hemispherical* mass, the lamellar denticulations appear as deep pits; but the imperfect state of conservation often leaves them only dimly discernible. By the equality of these pits in the 48 grooves, the species seems to be clearly distinct from *T. bina.*

Size.—A compressed specimen, D. 18; *d.* 10; A. 15.

(*Old*).—The figure remaining the same as in the young specimen, the lamellæ became double in number by the introduction of a new or secondary series, equally bold as the others near the edge.

Size.—D. 28; A. 20.

Locality.—In North Devon: Brushford; Pilton; Linton.

In South Devon: Fowey Harbour.

N.B. The two following species are introduced to complete the account of this genus.

6. Turbinolopsis elongata, *pl.* 2, *fig.* 6 *B.*

Ref.—*Lonsdale*, in Silurian Researches, *pl.* 16, *bis*, *fig.* 6.

Character.—General figure very *elongate,* regularly conical (or a little curved).

External surface longitudinally striated, and marked by very distinct annular lines of growth, and a few large undulations.

Internal surface ribbed by 64 to 96 lamellæ, which are almost equal near the edge of the cup, but become alternately very prominent and very faint downwards from the edge, so that at the base of the steep sides of the cup the faint lamellæ die away obscurely, but the others grow to be extremely prominent; in the base of the cup the lamellæ are a little twisted.

Size.—D. 20 to 25.

Locality.—Horderley, May Hill, Lickey Hill, and other places.

In a specimen, otherwise very fine, from May Hill, the denticulations are very obscure. In another, from the Lickey, they are very distinct.

7. TURBINOLOPSIS RUGOSA, *pl.* 2, *fig.* 7 *C.*

Character.—(*Young*).—General figure an obtuse cone. The cast of the interior shews about 60 deep grooves corresponding to the lamellæ, all deeply and boldly punctated. Half of these terminate at half the length of the side of the cone.

Size.—D. 20; A. 12.

(*Old*).—General figure an obtuse cone. The cast of the interior has two or three concentric undulations, which give it a rugged aspect, and about 72 deep grooves at the edge, corresponding to the lamellæ, half of which terminate after traversing about half the length of the cone.

The lamellar denticulations appear to have been all bold and strong, but unequal, some of them rising into high points.

Size.—D. 30; A. 28.

Locality.—Snowdon, near the summit.

Genus. AMPLEXUS.

(First noticed by *Sowerby*, in Min. Conchology of Great Britain.)

Character.—Animal unknown.

General figure.—Cylindrical, elongated.

Structure.—Central parts composed of a sort of cylinder of plane (or slightly waved) transverse imperforate plates or septa, with regular cavities or chambers between; these are crossed by a sheath of thin vertical radiating lamellæ near the margin, which outwardly end in a case annularly and longitudinally striated.

This coral, which is allied to Cyathophyllum, has a structure much like that of a Polythalamous shell, and the late Mr. Sowerby, who constructed the genus, formerly described it as such. The internal fluted and annulated cylinder (which in some specimens, and in particular states of conservation, easily separates) may be mistaken for an Orthoceratites. There are probably several species in the mountain limestone besides that which, in honour of Mr. Sowerby, I have named *Amplexus Sowerbii.* One of them is perhaps identical with the following species.

8. AMPLEXUS TORTUOSUS, *pl.* 3, *fig.* 8.

Character.—General figure cylindrical, elongate, and tortuous: transverse septa not crenulated towards the edge of their surface; marginal lamellæ, about 24 in number, entire; septal cylinder externally wrinkled or annulated, and longitudinally striated; for each central transverse plate there appear to be two marginal ascending continuations across the vertical lamellæ.

Size.—7 millimeters in diameter. Its section is often elliptical.

The septa of this species are either plane or considerably undulated; the diameter is nearly equal throughout. There is a different species of a remarkably unequal, swollen, and even nodular elongated figure, which occurs in the lower part of the mountain limestone. It may be called *A. nodulosus*, and makes a near approach to Cyathophyllum.

Locality.—In South Devon: Plymouth; Torquay; Barton.
In Cornwall: South Petherwin.

Genus. CYATHOPHYLLUM.

With Mr. Lonsdale, I am disposed to rank in this genus, only such corals as have distinct broad transverse phragmata in the [redacted] numerous transverse central laminæ, with clear spaces between them, the vertical section shews a small cellular or vesicular structure throughout, and the horizontal section gives about the centre spirally complicated laminæ, which, continuing single or dividing irregularly, remain distinct over a good part of the section; but near the margin lose themselves in a complication of small plates lying in every direction.

I found, however, in a rolled specimen of Babbacombe limestone, one coral, of the elongated shape, which occurs in some specimens of the Silurian coral, with *very broad central plates,* and few marginal lamellæ. It is represented (pl. 7, fig. 9); it probably belongs to this species.

10. CYATHOPHYLLUM CÆSPITOSUM, *pl.* 3. *fig.* 10.

Ref.—Cyathophyllum cæspitosum. *Goldfuss*, Petref., *pl.* 19, *fig.* 2. *Lonsdale*, Geol. Trans., 2nd Series, vol. v. *pl.* 58. *fig.* 8.

Composed of diverging conical parts, which branch off in fours or sixes, the terminal cell excavated; companulate, lamellæ alternately larger and shorter.—*Goldfuss.*

We may add—the branches are flexuous, or regularly and irregularly bent, and striated lengthways: the lamellæ are denticulated, and in one specimen about 40 in number at the circumference.

Locality.—In North Devon: Lee Quarry, at Combe Martin; Hagginton; and Hillsborough, near Ilfracombe.

In South Devon: Torquay; Newton Bushel; Plymouth; Bovey Sand.

Genus. CYSTIPHYLLUM. (As defined by *Lonsdale.*)

11. CYSTIPHYLLUM DAMNONIENSE, *pl.* 4, *fig.* 11.

Ref.—Cystiphyllum damnoniense. *Lonsdale,* in Geol. Trans., New Series, vol. v. *pl.* 58, *fig.* 11.

Character.—Cylindrical or turbinated; surface longitudinally striated; internal lamellæ more or less distinct till near the centre, which is entirely an irregular cellular or vesicular mass; terminal cell concave, indistinctly radiated, often tubercular.

The greater number of specimens which I have examined shew at the extremity, and on the clear cross section, the radiating lamellæ, without difficulty, and the largely cellular or vesicular central structure, varying considerably in its extent. This may perhaps depend in some degree on the part of the coral examined, the lamellæ being most perfect and continuous near the concave termination, while near the apex of the conical mass the complicated and vesicular structure prevails. In a vertical section all appears vesicular, the central structure being most open, but not at all like the concamerations of Cyathophyllum.

Locality.—In South Devon: Newton Bushel; Sharkham Point; Babbacombe.

12. Cystiphyllum vesiculosum, *pl.* 4, *fig.* 12.

Ref.—Cyathophyllum vesiculosum. *Goldfuss*, Petref., p. *pl.* 17, *figs.* 5 and 18, *g.* 1.

Character.—Obconico-turbinated, the terminal cell depressed into a funnel-formed cavity; the lamellæ confluent into vesicles. The lamellæ, where they appear as a part of the vesicular structure, are denticulated. On a cross section no radiating lamellæ, on a vertical section no transverse septa, appear. The surface, in Goldfuss's figures, is smooth, but annulated.

Mr. Lonsdale describes *Cystiphyllum Siluriense* as strongly striated; and his figure marks strong longitudinal striæ. My Devonshire specimen is, as far as I have been able to see, nearly or quite destitute of longitudinal striæ, and having so entirely vesicular a structure, with no trace of lamellæ, appears to me distinct from the ordinary form of *Cystiphyllum damnoniense,* and also from *Cystiphyllum Siluriense.*

Locality.—In South Devon: Babbacombe.

Genus. Strombodes.

Etym. στϱομβος, from στϱεφω—torqueo. (In allusion to the lamellæ spirally twisted about the centre.)

13. Strombodes helianthoides, *pl.* 5, *fig.* 13.

Ref.—Cyathophyllum helianthoïdeum. *Goldfuss, tab.* 20, *fig.* 2.

Character.—General figure a short oblique curved cone; the margin of the terminal cell subreflexed, expanded, with an umbilicated centre; 60 to 80 lamellæ in pairs, irregularly twisted at the edge of the umbilicus, within which they are complicated together.

Locality.—In South Devon: Plymouth; Babbacombe; Sharkham Point, &c.

In referring the specimens represented in pl. 5 to this species, I am guided by the drawings and descriptions of Goldfuss, who particularly mentions the complication of the laminæ near the centre in *Cyathophyllum helianthoideum,* and not in any other species of the genus. They are in fact twisted together in parcels, and the general short curved conical figure of the coral, and its expanded disk, seem perfectly to resemble specimens which I have seen from the Eifel. Such a character separates them from Cyathophyllum of Lonsdale. The coral represented at the bottom of this plate (13 β,) is from North Devon; and its denticulated lamellæ seem to claim for it a distinct title. It is, in fact, very like some specimens of what is called *Turbinolia fungites* in the mountain limestone.

14. STROMBODES VERMICULARIS, *pl.* 7, *fig.* 14.

Ref.—Strombodes vermicularis. *Lonsdale,* in Geol. Trans., New Series, vol. v. *pl.* 58, *fig.* 7.

Character.—General figure cylindrical, straight, or curved; externally traversed by vertical ridges marking the position of the internal lamellæ, and by concentric rugæ and fine lines: internally formed of numerous lamellæ, which are spirally contorted in the centre, and bifurcate as they radiate more or less regularly to the circumference.

Locality.—In South Devon: Dartington; Plymouth; and Newton Bushel.

Not having obtained specimens so satisfactory in regard to the structure of this coral as those which Mr. Lonsdale has represented, I have thought it best to copy his figures and description.

Genus. ASTRÆA.

15. ASTRÆA PENTAGONA, *pl.* 6, *fig.* 15.

Ref.—Cyathophyllum pentagonum. *Goldfuss, tab.* 19, *fig.* 3. *Lonsdale,* Geol. Trans., New Series, vol. v. *pl.* 58, *fig.* 1, 1 *a.*

Character.—Stars irregular, pentagonal or hexagonal, with boundaries bent in zigzag to meet the alternate rays of contiguous stars. Rays about 20, half of them ending near the centre of the star.

Locality.—In South Devon: Torquay; Plymouth; Newton Bushel.

16. ASTRÆA HENNAHII, *pl.* 6, *fig.* 16.

Ref.—Astræa Hennahii. *Lonsdale*, in Geol. Trans., vol. v. *pl.* 58, *fig.* 3.

Character.—Stars indefined; on the weathered surface they are prominent in the centre. Rays about 36, of a crenulated structure, alternately long and short; the latter terminating around the central portion of the star, and the former, *which swell out at the same boundary*, suddenly become attenuated beyond it, and are prolonged as fine laminæ to a reticulated centre. The rays of one star unite [so as to be often continuous] with those of the adjoining stars, the junctions being more or less regular according to their positions with respect to the angles of the stars. In the vertical section the lamellæ appear as parallel lines, united by numerous transverse plates.

The above description is almost verbatim from Mr. Lonsdale. I have added the words in brackets, from a beautiful polished specimen in my possession (fig. 16 *c*.), which may be distinct.

I found in the limestone of Flintshire a species very like this, and perhaps identical with it. The stars have a minute central umbo, in a hemispherical cup; the interstellar surface is nearly flat, and crossed from star to star by sharp crenulated lamellæ, united by numerous thin transverse plates.—*See* pl. 7, fig. 15 D.

Locality.—Barton; Newton; Plymouth.

17. ASTRÆA INTERCELLULOSA, *pl.* 6, *fig.* 17.

Character.—Stars concave with obtuse margins, connected with one another by the mutual interference and cellular union of the radiating lamellæ. These are about 34 in number, alternately longer and shorter, very thin and crenulated or vesicular on the external edge (minutely flexuous in the polished section); the shorter lamellæ end around the central axis.

The terminal cells are represented in fig. *a*; the lamellar edges in fig. *d*; the polished transverse section, with the interstellular cells, in fig. *b*; and a vertical natural cleavage along one of the lamellæ in fig. *c*. In this figure the incremental lines and depth of the growing cell may be traced. The analogy with *Acervularia Baltica (Astræa ananas Auct)* is extremely close, but that species has far more numerous lamellæ.

Whether this was really distinct from *A. Hennahii* of Mr. Lonsdale I had great doubts, but the want of real continuity of the lamellæ, the interstellular cells, the absence of the irregularity of breadth of the lamellæ at the inner termination of the shorter ones, and the much larger size, determined me to call attention to the facts by an appropriate designation.

Locality.—In South Devon: Torquay.

18. ASTRÆA, or ACERVULARIA BALTICA, *pl.* 7, *fig.* 18 E.

Though this coral has not been recognized among the Devonshire fossils, its analogy to *A. Hennahii* and *A. intercellulosa*, and its own extreme beauty, make me desirous of adding characteristic figures for comparison. The fine specimen of which I have represented a portion, is from the Wenlock limestone; *a*, being of the natural size, *b* and *c*, magnified parts of the rays and centre.

Genus. PORITES.

Syn. Astræa. *Goldfuss.*
Heliopora. *Blainville.*
Porites. *Lonsdale.*

To this genus Mr. Lonsdale has referred the partially lamelliferous corals formerly called *Astræa porosa* by Goldfuss, and ranked with Heliopora by Blainville. Their affinity to Heliopora, except in the number of lamellæ, which is here always 12, has always appeared to me very considerable, and Mr. Lonsdale's recent very careful examination of the Devonshire specimens (Geol. Trans., 2nd Series, vol. v. part 3,) seems to render it desirable, as he suggests, that a new genus should be formed to include the few species which have been discriminated by him. All yet known occur in strata older than the mountain limestone, as in the Ludlow, Wenlock, and still lower rocks, and in the Eifel limestone on the continent. We have specimens from the 'grauwacke' of the south of Scotland, and from Westmoreland.

19. PORITES (?) PYRIFORMIS, *pl.* 7, *fig.* 19.

Ref.—Astræa porosa. *Goldfuss.* Petref. *tab.* 21, *fig.* 7.
Heliopora pyriformis. *Blainv.* Actinologie, *p.* 392.
Porites pyriformis. *Ehrenb. Lonsdale,* in Geol. Trans., 2nd Series, vol. v. part 3, *pl.* 58, *fig.* 4.

Character.—Lamelliferous tubes, generally separated from one another by an interval greater than their own diameter; the interval being filled by polygonal tubuli one-third of the others in diameter, and in number about thirty times as great. Horizontal septa in the large tubes, separated about half the diameter of the tube: those in the small tubes distant about one diameter of these tubes, and generally on the same level in several adjoining tubes.

Locality.—In South Devon: Babbacombe; Torquay; Newton; Plymouth.

It appears to me that the Devonshire specimens are distinguishable, at least as constant varieties, from those of the Wenlock limestone. The diameter of the lamelliferous tubes is greater in the Wenlock specimens than in those from Devonshire, while the latter uniformly exhibit the tubes at greater distances from one another, and separated by a far greater number of polygonal cells. This difference may be easily recognised in specimens, and in the drawings given in the Silurian Researches and the Geological Transactions. There are about 30 polygonal tubes to one lamelliferous tube in the Devonshire specimens, and seldom so many as 20 to one in the Shropshire examples. The intervals between the lamelliferous tubes in the Devonshire specimens commonly much exceed their diameter, but generally falls short of it in those from Shropshire. In these particulars the Devonshire and Eifel specimens agree, as may be seen by comparing our figures with those of Goldfuss. If, in addition to this, a perfect Shropshire specimen be compared with Mr. Lonsdale's drawings and description of the fine examples supplied by Mr. Austin's cabinet from Newton, the difference will appear so great as to render it probable that the Silurian and Devonian species are not the same. If so, the specific name of the former may require to be changed.

Within the area of 0·5 of an inch square, about 40 to 50 of the lamelliferous tubes appear on my Shropshire specimens, but in the same area of the Devonshire specimens about 25 to 30 only. The diameters of the large tubes, both in the Shropshire and Devonshire specimens, are about three times as great as those of the smaller ones.

Genus. FAVOSITES.

The substitution, by Goldfuss, of the term Calamopora for Favosites of Lamarck, has been followed by much confusion in nomenclature. Lamarck, in his characters for Favosites, makes no mention of the connecting tubuli: on this character Goldfuss rests his genus Calamopora; with Dr. Fleming I therefore referred to Favosites some minute species (from the carboniferous limestone,) which appeared deficient in these tubuli. Blainville and Mr. Lonsdale have restored the Lamarckian name for the true Calamoporæ of Goldfuss. The species hitherto published belong to the Palæozoic strata exclusively, being found in the Ludlow and Wenlock rocks, in the Eifel, Scandinavia, North America, and in the carboniferous limestone of Britain.

20. FAVOSITES POLYMORPHA, *pl.* 8, *fig.* 20.

Ref.—Calamopora polymorpha. *Goldfuss*, Petref., *p.* 79, *tab.* 27, *fig.* 4.

Lonsdale, in Silurian Researches, *pl.* 15, *fig.* 2.

Character.—Coral ramose, dichotomous; tubes externally prismatic, with connecting lateral openings alternating in rows, internally cylindrical; the openings generally oblique; transverse septa plane.

One of the most frequent of all the Devonian corals.

Locality.—In North Devon: Lee Quarry, near Combe Martin; West Hagginton; and Hillsborough, near Ilfracombe.

In South Devon: Babbacombe; Torquay; Hope; Sharkham Point; Mudstone Bay, &c.

21. FAVOSITES GOTHLANDICA, *pl.* 7, *fig.* 21.

Ref.—Favosites Gothlandica. *Lamarck*, Anim. sans verteb.
Calamopora Gothlandica. *Goldfuss*, Petref., *tab.* 26.
Favosites Gothlandica. *Lonsdale*, Sil. Syst., *pl.* 15, *fig.* 3-4; in Geol. Trans., 2nd Series, vol. v. part 3.

I have collected many specimens of this coral at Sharkham Point, south of Torquay; and have seen others from Babbacombe and Plymouth, but none of them were fit for representation. At Sharkham Point, in thin limestone beds the specimens are often compressed, so as to exhibit on the sides of the mass an obliquity of the usually transverse septa. The figure represents this character in a slight degree, as seen in the oblique section of a large radiating mass.

Locality.—In South Devon: Sharkham Point; Plymouth; Babbacombe.

22. FAVOSITES RAMOSA, Brassart, *pl.* 8, *fig.* 22.

See new genus Caunopora, page 19.

23. FAVOSITES SPONGITES, *pl.* 8, *fig.* 23.

Ref.—Calamopora spongites, *var.* α. *Goldfuss*, Petref., *p.* 80, *tab.* 28, 1.
Favosites spongites. *Lonsdale*, in Sil. Syst., *pl.* 15, *bis. fig.* 8.

Character.—A tuberous mass, of small short (often flexuous) tubes, externally prismatic, internally round or oval, divided by plain distant septa, and communicating one with another by pores (placed at the angles?)

Locality.—In South Devon: Babbacombe; Hope, &c.

The often flexuous character of the tubes in Devonshire and Silurian specimens is not noticed by Goldfuss, who describes examples from Bensberg and the Eifel. I find, on carefully examining fine specimens usually referred to *Favosites septosus* of Fleming, from Bristol, that they are decidedly analogous to the *Favosites spongites* of Devon, as Mr. Lonsdale has already remarked.

24. PLEURODICTYUM PROBLEMATICUM, *pl.* 9, *fig.* 24.

See page 19.

25. Favosites fibrosa, *pl.* 9, *fig.* 25.

Ref.—Calamopora fibrosa, *var. α. Goldfuss*, Petref., *tab.* 28, *fig.* 4.

Favosites fibrosa. *Lonsdale*, Sil. Syst., *pl.* 15 *bis*, *fig.* 6.

Character.—Massive, cylindrical, or ramose, with elongated capillary angular tubes, connected by tubuli at the angles.

The tubes appear never flexuous, but radiate from an axis, and in our specimens shew very clearly the connecting tubuli. They are certainly identical with the Silurian fossils, figured by Lonsdale. Whether they differ from a mountain limestone fossil which I have named *Favosites capillaris*, may be doubted, especially as in that species I have lately detected connecting foramina. A large mass from Dartington also agrees, in general appearance, with my specimens from Gordale in Yorkshire.

Locality.—In North Devon.

In South Devon: Dartington, near Totness; Sharkham Point; Babbacombe, &c.

Genus. MANON (?).

26. Manon cribrosum, *pl.* 9, *fig.* 26.

Ref.—Manon cribrosum. *Goldfuss*, Petref., *tab.* 1, *fig.* 10.

An incrusting or thinly expanded leaf-like coral, one side bearing many round smooth hemispherical pits in the midst of a small reticulated structure.

I always imagined, on looking repeatedly at Goldfuss's figure, that it represented a portion of *Astræa porosa* of that author; but I have abandoned that conjecture since finding several specimens much like it in the argillaceous rocks of North Devon. My specimens seem not to have been attached to solid bodies, but to have been formed as thin foliaceous expansions, smooth on one side, and celluliferous on the other. I do not know certainly whether in these specimens the large pits passed through the plate, as Goldfuss seems to state.

Locality.—In North Devon only: Brushford; Pilton.

Genus. STROMATOPORA.

27. STROMATOPORA POLYMORPHA, *pl.* 10, *fig.* 27.

Ref.—Stromatopora polymorpha. *Goldfuss*, Petref., *tab.* 64, *fig.* 8. *Lonsdale*, Geol. Trans., New Series, vol. v. *pl.* 58, *fig.* 2.

Character.—Of irregular form; composed of concentric layers and vertical filaments. The horizontal section shews an irregular radiated and rather net-like texture round irregularly situated centres.

Figure *a*, is from a weathered specimen; figure *b*, shews a magnified view of the radiated structure.

Locality.—In South Devon: Dartington, near Totness; Chudleigh.

28. STROMATOPORA CONCENTRICA, *pl.* 10, *fig.* 28.

Ref.—Stromatopora concentrica. *Lonsdale*, in Sil. Researches, *pl.* 15, *fig.* 31.

Character.—Irregularly expanded, hemispherical, or tumid; formed of very numerous approximate thin parallel concentric laminæ, traversed by slender straight tubes, so that a section perpendicular to the laminæ shews a fine reticulated structure.

The specimens from which I describe appear to be perfectly distinct from *Caunopora placenta.*

Locality.—In South Devon: Chudleigh; Torquay.

New Genus. CAUNOPORA.

Etym. χαυνος—loose. πορος—perforation.

29. CAUNOPORA PLACENTA, *pl.* 10, *fig.* 29.

Ref.—Coscinopora placenta. *Lonsdale*, Geol. Trans., New Series, vol. v. part 3, *pl.* 58, *fig.* 5.

Character.—Amorphous; composed of concentric or nearly plane masses, perforated by flexuous or vermiform small tubuli, and by larger straight sub-parallel, or radiating, open (?) non-lamelliferous (?) tubes, persistent through the whole mass.

Mr. Lonsdale has, with great acumen, extricated the true character of this singular coral, which under some aspects appears obscurely to unite the groups now called Stromatopora (as in *S. polymorpha,*) and Porites (as in *Astræa porosa*). It has surely but little analogy with the genus Coscinopora of Goldfuss, (as Mr. Lonsdale seems also to think,) and appears deserving of a new generic title. This being the case, I venture to suggest for it the name of Caunopora, in allusion to its loose and irregular porosity.

Locality.—In South Devon: Torquay; Plymouth.

22. CAUNOPORA RAMOSA, *pl.* 8, *fig.* 22.

Ref.—Favosites ramosa. *Brassart,* as quoted by Lonsdale, in Geol. Trans., 2nd Series, vol. v. *p.* 737.

Character.—A slender elongated cylindrical or branching coral, with a surface roughened by the prominent edges of flexuous tubes penetrating the irregular spongy tissue of the coral, of which the central axis is generally hollow. No transverse septa (?); no communicating pores (?).

Locality.—In South Devon: Chudleigh; Babbacombe.

This slender coral has the irregular tissue of the last coral in a very different general form. It suggests a comparison with several published figures, as *Calam. spongites,* Goldfuss, tab. 64, fig. 10; *Calam. fibrosa,* Goldfuss, tab. 28, fig. 4; and *Calam. tumida,* Phillips, Geol. of Yorkshire, vol. ii. pl. 1, fig. 49-57; but agrees with neither. In form it approaches nearest to the var. of *Calam. fibrosa* referred to, but has not its structure. The singular looseness of the tissue, and the peculiarity of the usually hollow axis, combined with cylindrical form, seem to be sufficient for its identification. Mr. Lonsdale does not regard it as a Favosites. I see no septa in the vermicular tubes.

Genus. PLEURODICTYUM.

24. PLEURODICTYUM PROBLEMATICUM, *pl.* 9, *fig.* 24.

Ref.—Pleurodictyum problematicum. *Goldfuss, tab.* 38, *fig.* 18.

A circular, or oval discoid mass, concentrically striated beneath; above opening into many pyramidal approximate (aphragmal ?) cells, which are connected by many irregularly scattered tubuli.

Goldfuss's figure represents a (natural) horizontal section across the cells; and I have therefore chosen to give a view of their lateral appearance as they are seen moulded in the soft slaty rock. My specimens do not shew that peculiar pitted aspect which is represented, by Goldfuss, on the discoid surface. It is singular that my specimens, as well as those of Goldfuss, shew what seems to have been a vermicular perforation in the coral, now filled by stone.

The resemblance of this to ***Favosites megastoma*** of the mountain limestone, Geology of Yorkshire, vol. ii., pl. 2, 29, and *F. tenuisepta*, pl. 2., fig. 30, species which, like this, are perhaps aphragmal, or to have no transverse septa, is considerable.

Locality.—Found in laminated sandy shales at Meadsfoot Sands, near Torquay, (below the limestone of Torbay).

Genus. GORGONIA.

30. GORGONIA RIPISTERIA, *pl.* 9, *fig.* 30.

Ref.—Gorgonia ripisteria. *Goldfuss*, Petref., *pl.* 7, *fig.* 2.

Character. — Very much ramified into a reticulated plane surface; the branches sub-compressed, coalescing, finely striated, with a granulated crust.

The fossil which I have represented was taken by me from the under surface of a pale slaty argillaceous bed, on the north side of Mudstone Bay, in April 1840. On comparing it with the figure above referred to in Goldfuss, I find so much resemblance as to induce me to adopt his specific name. I have not [redacted] the axis. Intercellular spaces granular (or porous ?). No branched specimens have been seen.

It is closely allied to *Millepora rhombifera,* Phillips's Geology of Yorkshire, vol. ii. pl. 1, fig. 35.

Locality.—In North Devon: Croyde; Brushford; Pilton.

32. MILLEPORA SIMILIS, *pl.* 11, *fig.* 32.

Comp.—Millepora repens. *Lonsdale,* in Sil. Researches, *pl.* 15, *fig.* 30 (not 30 *a*).

After comparing my few and small specimens of the branching coral, the best part of whose surface is represented in figs. *b* and *c,* with some specimens allied to *Millepora repens* of the Wenlock limestone, I suppose they are of one variable species. Specimens like Mr. Lonsdale's figure 30 I have not seen in Devonshire.

Locality.—In North Devon: Cannington Park.

In South Devon: Hope, near Torquay.

Genus. GLAUCONOME.

Character.—Coral branched, ramifications in one plane, poriferous on one face; pores arranged alternately in two adjacent lines along all the branches; reverse, longitudinally striated.

The single species of Glauconome of Goldfuss, to which this generic name has been preserved by Lonsdale, appears, in many respects, very analogous to Fenestella and Retepora. Its branches are free, and all the ramifications are poriferous. The pores are, when perfectly seen, much larger in proportion than in Fenestella, so that the two rows occupy all the obverse face of the coral. (There are signs of lateral rows in *G. disticha.*) The reverse is striated. The branches are either alternate or opposite, or asymmetrical. Another species has been described, by myself, from the mountain limestone, as a Retepora. We have here a third.

33. GLAUCONOME BIPINNATA, *pl.* 11, *fig.* 33.

Coral plumose, bipinnately branched, all the ramifications bearing two rows of adjacent oblong pores; the ultimate ramifications short, and nearly straight. Reverse striated with granulated lines.

On comparing this species with *Retepora pluma,* Phillips's Geology of Yorkshire, vol. ii. pl. 1, figs. 13, 14, 15; and with *Glauconome disticha,* Goldfuss, tab. 64, fig. 15; or Lonsdale, in Silurian System, pl. 15, fig. 12, the close analogy of the three forms becomes evident. Mr. Lonsdale has slightly referred to the bipinnate ramification of his coral. In only one case have we seen it in our Devonshire specimens (Croyde). The lateral branches of *Retepora pluma* are longer, and those of *Glauconome disticha* more irregularly disposed. The pores *project* in *Retepora pluma,* and those on the lateral branches are nearly round. In *Glauconome disticha,* the pores are subquadrangular and not prominent; the stem and branches are four-sided (vierseitig), and the longitudinal striæ on the reverse are fewer, more prominent and continuous, than in the Devonshire specimens.

Locality.—In North Devon: Croyde; Pilton; Brushford.

Genus. FENESTELLA.

Many years ago, Mr. Miller, of Bristol, in a correspondence on the subject of fossil Zoophyta, suggested that a new genus should be constituted for some of the reticulated corals, allied to Retepora, in the carboniferous limestone. On mentioning this to Mr. Lonsdale, he at once adopted the suggestion, and named a species of the Silurian strata, *F. Milleri.*

In general, the main distinction between this group and Retepora is in the position of the pores or cellules, which are internal in Retepora, and external in Fenestella. But in several instances the conical figure, on which this distinction depends, is almost absent; the coral spreads from a centre nearly on a plane, and it is not always possible to depend on this mode of discrimination.

Another mark of distinction may often be resorted to. The non-poriferous internal surface of Fenestella is usually marked by longitudinal, more or less continuous ribs, united by transverse bars of smaller diameter, leaving oval or sub-quadrangular spaces. In Retepora, these spaces look more like holes or perforations through the coral. The external poriferous interstices of Fenestella are in several species, but perhaps not in all, carinated in the middle.

The following appear to be the principal characters :—

General figure spreading from a narrow base to an infundibuliform or foliaceous figure; substance a thin stony expansion, composed of slender radiating or longitudinal ribs, variously connected by transverse bars, so as to constitute a more or less regular open net-work; the longitudinal ribs margined on each edge by one row of pores *on the outer face* only.

Owing to the decomposition of the whole or part of the coralline substance in argillaceous beds, these beautiful fossils must be studied in such cases by very careful comparison of the *impressions* of the surfaces; in limestone beds the substance is often well exposed by atmospheric influence, but in such instances the poriferous face seldom clearly appears, owing apparently to the firmer adhesion of this face to the rock.

The species vary in respect to the size and form of the openings of the net-work; the frequency, size, and situation of the pores along the sides of the ribs; the striated or granular aspect of the non-poriferous surface, and other less marked particulars. It happens in one instance that the transverse bars are, as well as the longitudinal ribs, (irregularly) poriferous, and there are cases in which some part of a specimen shews four rows of pores along each rib. This probably happens only previous to the origin of a divarication of the rib. The lines of *pores* are close to each other, so as to interlock or inosculate, in *F. antiqua*, &c., and lie wider apart in *F. arthritica*, and others; but the cells to which the pores belong probably touch internally in all the species.

34. Fenestella laxa, *pl.* 12, *fig.* 34.

Ref.—Fenestella laxa. *Phillips*, Geol. of Yorkshire, vol. ii., *pl.* 1, *fig.* 26-30.

Character.—Net-work extremely large and irregular; obverse bearing two rows of tubular pores, reverse granuloso-striated.

I have compared the specimens from Devonshire with those which I possess from the mountain limestone, and I conceive there is no difference, beyond that which may arise from the manner of conservation, and the degree of perfection with which the surface is seen. A little rubbing away of the external granulated layer brings to view traces of the internal poriferous cells.

Localities.—South Petherwin; Croyde. One of the specimens from the former place has a slight redness, apparently not derived from oxyde of iron, but the remains of its original colour.

35. FENESTELLA ANTIQUA (?), *pl.* 12, *fig.* 35.

Ref.—Fenestella antiqua (?). *Lonsdale*, Geol. Trans. 2nd Series, vol. v.

Character.—Network of open tissue, with narrow partitions, and oval angular fenestrules (the longitudinal ribs often straight,) the transverse bars generally thin. Pores about four or five along the sides of each opening, *arranged alternately in inosculating lines.*

Var. α. Longitudinal ribs straight, network elongate, quadrangular.

β. Longitudinal ribs flexuous, network loose, oblong, diversiform.

γ. The partitions thick, both longitudinal and transverse bars granulated on the reverse.

δ. Network of large tissue and very thin partitions, on the sides of which the pores are ranged at such distances as rather to form one geniculated row than two approximate lines of alternating pores.

Mr. Lonsdale has not been without doubt in giving Goldfuss's name to this very plentiful Devonshire species. Before I received the volume of Transactions in which his essay appeared, I had used the same argument which struck him for distinguishing the species, *viz.*, the remarkable approximation and inosculation of the two lines of pores. If to this positive character of the Devonian specimens we add that in them the interstices are *round* or nearly so in the section, while Goldfuss expressly says that in the Eifel specimens they are *tetragonal*; enough seems to be proved for separating the species. My remarks apply, however, chiefly to the fossils of North Devon and Petherwin. The species is very closely allied to *Retep. flabellata* of the mountain limestone.

Locality.—*Var.* β, γ. In North Devon: Pilton; Brushford; Croyde.

In Cornwall: South Petherwin.

In South Devon: Plymouth; Barton.

Var. α. Linton; Watersmeet; West Lee; Woodabay; South Petherwin.

δ. South Petherwin.

36. FENESTELLA ARTHRITICA, *pl.* 12, *fig.* 36.

Character.—Network of thick (often flexuous) ribs, and thick transverse bars, sometimes tumid at the intersections, with oval openings, which, from the defect of transverse bars, often become geminate, and near the base run into continuous undulated interstices. Reverse granulated; when a little worn it shews the bases of the poriferous cells alternating in two rows. Pores in two distinct lines, about three on the sides of an opening, besides one or more at the origin of the transverse bars.

Var. α. Network large and regular, with elongated sub-hexagonal openings.

β. Network mostly irregular, with quadrate or roundish openings.

γ. Network small and regular, with oval openings.

It is possible that more than one species may here be ranked together. The variations *α* and *γ* appear very widely separated in respect of size; *β* is variable. The most important general character is the thickness of the ribs and bars.

Locality.—In South Devon: Torquay; Hope, near ditto. In North Devon; West Hagginton.

Genus. RETEPORA.

37. RETEPORA PRISCA, *pl.* 13, *fig.* 37.

Ref.—Retepora prisca. *Goldfuss*, Petref., *pl.* 36, *fig.* 19.

The resemblance of the non-poriferous face of the specimens figured above to the drawings of *Retepora prisca* and *R. antiqua* of Goldfuss, and *R. flustriformis* of the Geology of Yorkshire, is such that it is amongst them we must look for the affinities of this coral. *Gorgonia antiqua*, Goldfuss, (*Fenestella antiqua*, Lonsdale,) may also be noticed in comparison. A fortunate circumstance has put in my possession a fine specimen of *R. flustriformis*, from which I am able to enlarge the characters given in my work, by making known a very unexpected point of its structure. It was not of conical growth, but the part hitherto published by Martin and myself is only a lateral fragment. When complete, it is like a very broad feather, with a strong striated midrib, from which the lines of pores and fenestrules pass right and left along the undulated leaf-like expansion.* The following will therefore be its character:—

RETEPORA FLUSTRIFORMIS.

Ref.—Retepora flustriformis. *Phillips*, Geol. of Yorkshire, vol. ii., *pl.* 1, *figs.* 11, 12.

Millepora flustriformis. *Martin*, Petrif. Derb. *pl.* 43 and 45*.

Character.—A thin coral expanded into a leaf-like form on each side of a central striated midrib. The expansions undulated; and perforated by many nearly equal oval fenestrules, arranged in sub-parallel lines meeting the central rib, at angles of about 60°. Along the interstitial spaces on one side of the coral are two slightly flexuous lines of pores, each bearing about five or six times as many pores as the number of fenestrules, the pores of one line standing opposite to the intervals of the other.

In *Retepora prisca*, as figured by Goldfuss, the interstitial line is very flexuous; the fenestrules are oval and equal, the pores are *remarkably close together*, the distance between them being not half their length (this might perhaps be owing to wearing), and they have an oval aspect, and their number in each row is five or six times as great as that of the opposite fenestrules.

In *Retepora flustriformis* the interstitial line is nearly straight or very little bent, the fenestrules are oval and equal, the pores are separated by spaces greater than their own diameter, they are round, and a little prominent, and in each row are about five or six times as numerous as the opposite fenestrules.

In *Gorgonia antiqua* (Goldf.), the fenestrules are oblong, rather than oval, and unequal, and the pores are remarkably few, only about three or four times as many in each row as the opposite fenestrules.—(*Fenestella antiqua*, Lons. in the Silurian System, has six times as many pores in each row as there are fenestrules.)

It is evident from these remarks that *Retepora prisca* and *Retepora flustriformis* have very great affinity. Whether the former was developed in a conical form cannot be known from the fragment figured by Goldfuss. The slight tendency to convergence in the lines of fenestrules which appears in his figure and in that which I have given in the Geology of Yorkshire, is not greater than what appears on an undulated part of the frond (if I may so call it) of my specimen of *Retepora flustriformis*, and is less upon the whole than what is seen on the Devonshire specimens.

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* *Retepora membranacea*, Geol. of Yorkshire, *pl.* 1, *fig.* 1, &c. springs in a conical cup from a repent slender stem.

The best example I have seen of the latter fossils is (part of it is represented pl. 13, fig. 37) of a convoluted, perhaps conical figure. If it be part of conical expansion, then it cannot be a Fenestella, for the poriferous face is internal. Yet I know not how to distinguish it certainly from *Retepora prisca* of Goldfuss, which is considered by Mr. Lonsdale the equivalent of his *Fenestella prisca;* but as in the drawing given in Sil. Researches, pl. 15, fig. 18, *b c*, the lines of pores are *straight*, the fenestrules much smaller, and the rows of pores more separate than in Goldfuss's figures, this reference appears doubtful. I can find no example of so large a pattern of *oval* fenestrules in the Silurian specimens at my command. Upon the whole, therefore, I am obliged to preserve, for the fossils which I have thus noticed, the name of *Retepora prisca.*

Locality.—In South Devon: Barton; Plymouth.

New Genus. HEMITRYPA.

Etym. *ʿημισως*—half, *τϱυπα*—perforation.

38. HEMITRYPA OCULATA, *pl.* 13, *fig.* 38.

Character.—A thin lamina of coral expanded in a cup-formed mass; external surface wholly covered with numerous round pores or cells, radiating from a centre, and associated in double rows, which near the centre undergo frequent division, so as to form two such rows.

Internal surface marked with radiating ridges, corresponding to the external interstices between the rows; between these ridges are many oval depressions, *which penetrate only half through the substance of the coral, and no where reach the outer face.*

It grows to the size of two or three inches in diameter. The internal face was like that of some Fenestellæ, but the peculiarities of the external surface seem to demand generic separation. The specimens are extremely perfect.

Locality.—In South Devon: Barton.

CRINOÏDEA.

Genus. PLATYCRINUS, OR PLATYCRINITES.

39. PLATYCRINUS INTERSCAPULARIS, *pl.* 14, *fig.* 39.

The genus has up to this date never been mentioned as occurring in any other than the mountain limestone strata of Britain; though on the continent of Europe it may be more widely diffused. When I first saw Mr. Austin's fine specimen (represented in pl. 14, fig. 39), its large interscapular plates attached to the pelvis gave it so much peculiarity, that I re-examined the species of Platycrinites which are represented in the third plate of the Geology of Yorkshire, before admitting it into that remarkably definite genus. Besides, however, the general evidence in favour of such a position, specimens occur occasionally in the mountain limestone having the same peculiarity. One is represented in my work, pl. 3, fig. 26.

I have since obtained a second, and seen two other specimens, one in the cabinet of Mr. J. E. Lee, and the other in Mr. Hennah's collection; and all, I believe, shew the interscapular plate.

Character.—General figure globose, attenuated towards the column. The pelvis is hemispherico-conical, with only a very minute circle of attachment for the small column. Its upper edge is very little undulated, receiving five scapular and one interscapular plate. The scapular plates are tumid on each side of the articular surface. The proboscal plates are large, and have generally a central prominence. All the plates are equally granulated, and the granulæ are rather dispersed than arranged with the symmetry observed in the mountain limestone species; being most plentiful in the upper part of the scapular and lower part of the pelvic plates. The plates are thinner than is commonly observed in the species previously known.

Locality.—In South Devon: Newton; Plymouth.

Genus. PENTREMITES, or PENTETREMATITES.

40. PENTREMITES OVALIS, *pl.* 14, *fig.* 40.

Ref.—Pentremites ovalis. *Goldfuss*, Petref., *pl.* 50, *fig.* 1.

Character.—General figure oval, attenuated at the base, interambulacral surfaces convex, reticulated with longitudinally diverging and transverse parallel striæ; ambulacra broad, margined by a deep groove.

This is quite distinct from any species as yet known to me in the mountain limestone of England.

Locality.—In North Devon: Brushford.

Genus. CYATHOCRINUS, or CYATHOCRINITES (?).

41. CYATHOCRINUS (?) MACRODACTYLUS, *pl.* 15, *fig.* 41.

The analogues of this beautiful species are *Cyath. tuberculatus*, Sil. Researches, pl. 18, fig. 7; and *Cyath.* or *Poterioc. nobilis*, Geol. of Yorkshire, vol. ii. pl. 3, fig. 40.

Mr. Williams, among some valuable specimens which he sent me in 1837, enclosed a fine example of this curious fossil. In 1840, I found at Brushford, in North Devon, the young of the species, and impression of the plates about the pelvis; and in Major Harding's collection saw with delight the full-grown body and arms.

If I interpret the specimens rightly, the pentagonal supracolumnar joint is surmounted by five plates, (pelvis of Miller,) alternately with which, and above them, are five rows of broad costal and scapular plates, four in each, the last being cuneiform. From this point, the hands and fingers go on dividing, and the number of joints in each successive branch augments. The arms, hands, and fingers are externally round: the finger ends are cirrhose.

On comparing this form with *Poteriocrinus* (*?*) *Egertoni*, *Poterioc. nobilis*, *Cyath. tuberculatus*, &c., it appears that they are congeneric; and that unlike other Cyathocrinites and Poteriocrinites, they might be characterized by having the scapular, costal, and cuneiform arm base in one row and of one breadth. Perhaps *Actinoc.* (*?*) *expansus*, of Sil. Researches, may be allied to them.

If, provisionally, we designate this group by the title of Isocrinites, and consider the specific characters as depending on the number of plates in the costal, and brachial, and digital series, we shall find

Isocrinus Egertoni, to have seven costals;
tuberculatus, three costals, and three brachials;
macrodactylus, four costals, five brachials, and six, ten, fifteen digitals;
nobilis, four costals, four or five brachials, and four, &c. &c. digitals.

It must, however, be remarked, that above the costal rows the numbers of brachial and digital joints vary in the same specimen, owing to an unequal development which is almost always remarked in these fossils. In *Isoc. macrodactylus,* the first digitals are six or seven.

Another difference arises from age, as remarked in Sil. Researches, in relation to *Cyath. tuberculatus;* and in Geol. of Yorkshire, in regard to Poteriocrinus.

Provisional Genus proposed. ADELOCRINUS.

Etym. αδηλος—obscure; combined with κρινον—lily.

42. ADELOCRINUS HYSTRIX, *pl.* 16, *fig.* 42.

Character.—General figure of the pelvis conical, with a narrow base of attachment; surface externally smooth, with numerous scattered tubercules.

Hardly any fossil among the many difficultly intelligible fragments which fill the rocks of Devonshire, has caused me more trouble than two pretty specimens, one of which is represented in fig. 42. It is a conical cavity, with a rather uneven margin, and a narrow circular faintly radiated base. This being taken for the supracolumnar articulation of a crinoid, the conical cup appears to be the outer impression of an undivided (?) pelvis, whose surface was muricated in a less regular style than is common in these geometrically constructed fossils. The form is a little compressed, as the cast which I have made in the cavity shews. Supposing it to be a crinite, as appears most probable, it cannot, I think, be easily ranked in any known genus; and, therefore, as the smallest error, I give it a name which will affect only itself.

Locality.—In North Devon: Brushford.

Genus. ACTINOCRINUS, OF ACTINOCRINITES.

43. ACTINOCRINUS TRIACONTADACTYLUS (?), *pl.* 16, *fig.* 43.

Ref.—*Miller's* Crinoidea, and various Authors.

I obtained this proboscal termination of an Actinocrinus from a fossil dealer at Torquay, with other specimens, which she had obtained in 1840 from the quarries at Newton.

It perhaps belongs to *Actinoc. triacondactylus.*

Locality.—In South Devon: Newton.

Columns of Crinites, more or less characteristic, though for want of other parts they are not certainly referrible even to the genera of the modern systems, occur very commonly in all parts of North and South Devon which yield fossils of any kind. Most of them are found, upon careful examination, to have pentagonal or pentaphylloidal alimentary canals. Some are finely muricated, others smooth, some tubercular. Auxiliary side arms also occur. Some specimens in South Devon and Cornwall are very large, as much so as some of the gigantic stems of the mountain limestone, usually referred to Cyathocrinus; or those which Miller figures under the title of *Cyath. rugosus* from the Silurian rocks; and are similarly perforated by a pentaphylloidal opening.

I have seen at Pilton the impression of a joint, corresponding in form (section lanceolate oval, disk with a transversal raised ridge,) to the trochites, which Mr. Miller refers to *Platycrinus lævis.*

The following are the most determinate of these forms; and I have assigned names chiefly to aid memory.

44. ACTINOCRINUS (?) TENUISTRIATUS, *pl.* 16, *fig.* 44.

Character.—The joints exceedingly thin, with very fine radiations; canal, minute; edge, muricated in *a*, *b*, plain in *c*, *d*, *e*.

Locality.—In North Devon: Linton; Pilton, &c.

In South Devon: Plymouth (slates), &c.

45. Columnar Joints of CYATHOCRINUS PINNATUS. *Goldfuss*, *pl.* 16, *fig.* 45.

Character.—Articulating disk, concave in the central parts;

raised towards the edges, and there distinctly radiated; side moniliform; joints alternately larger; canal obscurely pentaphylloidal.

Locality.—Saunton; Mudstone Bay, &c.

46. Cyathocrinus (?) nodulosus, *pl.* 16, *fig.* 46.

Locality.—In South Devon: Torquay.

47. Cyathocrinus (?) megastylus, *pl.* 16, *fig.* 47.

It being impossible to determine concerning these columns anything but some general relations to certain large columns of the mountain limestone, never yet found in connexion with bodies, I propose the above name for them. Miller's figures, 12, 13, 14, in pl. 11, *Rhodocrinus verus*, are like these; but his reference of the columns to the bodies cannot be depended on.

Locality.—In South Devon: Whitesand Bay.

48. Cyathocrinus (?) variabilis, *pl.* 16, *fig.* 48.

Character.—The articulating surfaces are various; canal minute, pentagonal.

Locality.—In North Devon: Pilton, &c.

49. Cyathocrinus (?) ellipticus, *pl.* 16, *fig.* 49.

These specimens are probably very closely allied to the last. The variety in the shape of the canal is paralleled and exceeded in the columns which Goldfuss has referred to *C. pinnatus*. The joints are excessively and unusually thick; the disk elliptical.

Locality.—In Cornwall: Petherwin.

CONCHIFERA PLAGIMYONA,

OR,

CONCHIFERA DIMYARIA.

Genus. PLEURORHYNCHUS.

50. PLEURORHYNCHUS MINAX, *pl.* 17, *fig.* 50.

Ref.—Pleurorhynchus minax. *Phillips*, Geology of Yorkshire, *pl.* 5, *fig.* 27.

Cardium aliforme, var. *Sowerby*, *tab.* 552, lower figure.

Cardium aliforme. *Goldfuss*, var. γ, *pl.* 142, *fig.* *h*, *i*, perhaps also var. β and δ of the same Author.

Character.—Deltoidal; anteriorly gibbous, rounded, with a contracted sub-concave cordiform space around the umbo; posteriorly elongated conoidal; beaks anterior, surface radiated with many equal ribs, except on the cordiform anterior space, where they are very much finer than on the other part, and are distinctly cut off by the carina which bounds the depression.

Goldfuss has united this with the preceding species, marking however the very obvious distinctions which really exist. Mr. Sowerby (Geol. Trans., 2nd Series, vol. v., explanation of pl. 56,) holds the same opinion. I am not at all convinced of the propriety of this decision, either by consulting figures and descriptions, or comparing specimens.

The present species occurs, with no important variations, abundantly, both smaller and larger than the figures, in the mountain limestone of England, Ireland, and the Rhine valley; while the true *P. aliformis* is found in the Eifel, as well as in the mountain limestone of England, rarely. Goldfuss marks the occurrence of each of the varieties of his *C. aliforme*, and those given for *P. minax* belong to carboniferous limestone. In Devonshire, this species occurs in the limestone of Bradley (Mr. De la Beche), and in the limestone of Halberton, north-east of Tiverton (Major Harding).

Locality.—In South Devon: Bradley.

In central Devon: Halberton, north-east of Tiverton.

51. Pleurorhynchus aliformis, *pl.* 17, *fig.* 51.

Ref.—Cardium aliforme. *Sowerby*, Geol. Trans., 2nd Series, vol. v. *pl.* 56, *fig.* 2.

Cardium aliforme. *Goldfuss*, var. *α*, *tab.* 142, *fig.* 1, *a* to *g*.

Character.—Sub-triangular; anterior surface cordato-convex; its border carinated; posteriorly conoidal; beaks sub-anterior; surface radiated with close ribs.

We may add that the anterior ribs are *only a little smaller than the posterior ones, nearly coincide with the direction of the keel on the angle,* and cover the whole of the anterior face, which is rather convex, or very obtusely conical.

Locality.—In South Devon: Barton.

Genus. SANGUINOLARIA.

52. Sanguinolaria sulcata, *pl.* 17, *fig.* 52.

Ref.—Sanguinolaria sulcata. *Munster*, Beitrage, 1840.

Compare Psammobia rigida. *Sowerby*, in Sil. Researches, *pl.* 8, *fig.* 3.

Character.—Transversely elliptical, sub-equilateral, the hinge line straight; valves with nearly central beaks, and a straightened front; sides rounded, and meeting the hinge line rather abruptly: surface raised in several bold transverse undulations.

(*N.B.*—In the figure (52 *a*), the angles at the end of the hinge line are too strongly expressed, and the outline gives rather too much equality to the sides. The specimen was imperfect.)

That this is the shell described by Count Munster, I am fully convinced. It is probably different from *Psammobia rigida* above referred to, as that has three distinct diverging ridges on the posterior side. Of such, there is no distinct evidence in either of the specimens here figured. Owing to their incompleteness, and the compression of one, I am not quite sure of their identity.

Locality.—In Cornwall: South Petherwin.

In South Devon: Combe.

53. Sanguinolaria elliptica, *pl.* 17, *fig.* 53.

Character.—Sub-elliptical, nearly equilateral, with an almost straight hinge line and rounded extremities; surface concentrically striated and undulated (extremities punctated?); beaks not prominent.

The shell is very thin, of a brownish colour, and is rather distorted by pressure. One of the specimens shews the two valves expanded, as if entombed soon after death. As to the genus to which this and the preceding species should be referred, opinions may differ; but it seems likely that with Psammobia or Sanguinolaria its affinities are strongest. I must however mention, that in regard to this and the former species, my first impression was to rank it as a Leptæna.

Locality.—Combe, near Ashburton; Yealm Bridge, near Launceston.

Genus. PULLASTRA.

54. PULLASTRA ELLIPTICA, *pl.* 17, *fig.* 54.

Character.—Very depressed, concentrically striated, remarkably elliptical, with beaks scarcely prominent.

Though so very simple in its characters, this shell appears distinct from any other with which I am acquainted.

Locality.—In Cornwall: South Petherwin.

55. PULLASTRA ANTIQUA, *pl.* 17, *fig.* 55.

Ref.—Pullastra antiqua. *Sowerby,* in Geol. Trans., 2nd Series, vol. v. *pl.* 53, *fig.* 28.

Character.—'Transversely elongato-ovate, slightly convex, concentrically striated, striæ distant; posterior extremity slightly and obliquely truncated. Length about half the width.'—(Mr. Sowerby.)

On examining the elegantly striated surface, we find the concentric elevations sharp and regular. The enlarged portion is drawn from an impression taken of the outside cast. Parallel to the elevated striæ are fine continuous lines.

Locality.—In North Devon: Pilton; Marwood.

56. PULLASTRA (?) COMPLANATA, *pl.* 17, *fig.* 56.

Ref.—Pullastra complanata. *Sowerby,* in Sil. Researches, *pl.* 5, *fig.* 7.

Character.—Transversely extended to a width nearly double the length: depressed; anterior extremity small, rounded; posterior extremity extended, oblique; front a little concave; surface smooth, shewing the lines of growth.

It resembles too closely *Pullastra complanata* of Mr. Sowerby to allow of its being referred to any other type. As to the genus, perhaps it should be ranked with the species described under Cypricardia.

Locality.—In North Devon: Pilton, one specimen.

Genus. CYPRICARDIA.

57. CYPRICARDIA SEMISULCATA, *pl.* 17, *fig.* 57.

Ref.—Modiola (?) semisulcata. *Sowerby*, Sil. Researches, *pl.* 8, *fig.* 6.

Compare Cypricardia undata, Sil. Researches, *pl.* 5, *fig.* 4; and Mya rotundata, Sil. Researches, *pl.* 6, *fig.* 1.

Character.—Transversely elongated, very convex; front concave near the anterior side, so as to give the shell an imperfectly bilobate character; beaks prominent, close to the anterior extremity; surface transversely undulated, the undulations prominent anteriorly, often interrupted near to the anterior lobe; increased in number posteriorly, and nearly obsolete on the posterior slope.

A remarkable appearance is given to the shell by the transverse furrows which on the posterior lobe of the surface receive intermediate shorter ones; and towards the anterior lobe, as well as on the posterior slope, become partially obsolete. See in comparison *Mya rotundata* and *Cypricardia undata.*

Locality.—In Cornwall: South Petherwin.

58. CYPRICARDIA IMPRESSA (?), *pl.* 17, *fig.* 58.

Ref.—Cypricardia impressa. *Sowerby*, in Sil. Res., *pl.* 5, *fig.* 3.

Character.—Transversely oblong, smooth; anterior extremity slightly truncated, the other pointed obtusely; *front concave;* hinge line straight, long; beaks near the anterior extremity. Variable in size.

The resemblance of the fossil figured to *C. impressa,* of Sowerby, is such as to make me suppose that further research and better specimens than my fragments from Devonshire may prove them to be identical; but there is some difference both as to the surface, which in the Devon fossil is sulcated on the anterior part —and to the figure, which in our fossil is but slightly depressed along the middle. In general figure it differs from *C. semisulcata.*

Locality.—In North Devon: Baggy Point (limestone).

59. CYPRICARDIA DELTOIDEA, *pl.* 17, *fig.* 59.

Character.—Ovate, rhomboidal, depressed, smooth; anterior side arched, a ridge distinctly separating the plane posterior surface from the convex middle and anterior part of the shell.

In the general figure it somewhat resembles *Axinus obscurus* of the magnesian limestone; and also has some analogy with *Isocardia* (?) *axiniformis* of the mountain limestone, (Geol. of Yorkshire, vol. ii. pl. 5, fig. 13.)

Locality.—In Cornwall: South Petherwin.

Genus. MEGALODON.

60. MEGALODON CUCULLATUM, *pl.* 17, *fig.* 60.

Ref.—Megalodon cucullatum. *Sowerby*, in Min. Conchol., *tab.* 568.
Megalodus cucullatus. *Goldfuss*, Petref., *tab.* 132, *fig.* 8.

Character.—Oval, very convex, smooth; beaks prominent, terminal, subspiral; lunule large, cordate.

The variation of form in the teeth of the hinge is not less remarkable than in some of the thick-shelled Renionidæ, to which and to Isocardia the genus seems related.

Is not *Cypricardia rhombea* of the mountain limestone of this genus, and allied to *Megalodus carinatus* of Goldfuss?

Locality.—In South Devon: Bradley.

Genus. MYTILUS.

61. MYTILUS (?) DAMNONIENSIS, *pl.* 17, *fig.* 61.

Character.—Remarkably oval and elongate, with a short straight prominent hinge line, projecting into a broad flat surface.

It does not agree with any species figured by Goldfuss or

Sowerby, and is too imperfect to allow of its characters being well determined. I propose the above as a name provisionally, to prevent the shell being forgotten.

Locality.—In South Devon: Newton Bushel.

Genus. MODIOLA.

62. MODIOLA AMYGDALINA, *pl.* 17, *fig.* 62.

Compare Modiola antiqua, Sil. Researches, *pl.* 13, *fig.* 1.

Character.—Obliquely elongated to an elliptical contour, narrowed anteriorly, gibbous, concentrically and finely striated with continuous sharp lines. Beaks very close to the very contracted (subauriculated) anterior side, incurved over the excavated small lunule.

It seems to have very much the aspect of a Megalodus, but I find, by comparison of specimens, that the young of *Megalodus cucullatus* is quite different, in its much less elongated figure. To Mr. Sowerby's figure the resemblance is very close. It is perhaps identical therewith, but appears rather more elongate. Goldfuss has also a *Mytilus* (*Modiola*) *antiquus*, which is different essentially, and to avoid confusion, I should prefer to employ a different name, such as is suggested above. The margin is a little concave just behind the sub-auriculiform anterior side.

Locality—In Cornwall; Petherwin.

Genus. NUCULA.

63. NUCULA PLICATA, *pl.* 18, *fig.* 63.

Character.—Depressed, obliquely ovate, posterior slope defined, posterior edge obliquely truncate. Surface smooth and shining, but concentrically striated on the body of the shell, and finely plaited on the posterior area.

Only by the plication of the posterior area can it be clearly distinguished from *N. luciniformis*, Phillips, in Geol. Yorkshire, vol. ii., pl. 5, fig. 2. How far this distinction of character may be constant, must be determined by further experience, since only a single good specimen has been found in the Devonian strata, and very few in the mountain limestone.

The figures do not shew well the *definite* posterior slope, nor its *plication* quite strong enough.

Locality.—In North Devon: Baggy Point (limestone).

64. Nucula lineata, *pl.* 18, *fig.* 64.

Character.—Deltoidal, convex, covered with striæ parallel to the margin, of which every third or fourth is much more prominent, margin plain within.

Var. α. The prominent striæ crenulated (?) *fig.* 64 α.

β. The striæ all even and plain, *fig.* 64 β.

This beautiful little shell was one of several rarities obtained by carefully breaking up nodules of limestone enclosed in the slaty rocks at Baggy Point. Some of the specimens were large, many very minute.

Locality.—In North Devon: Baggy Point, in limestone nodules.

65. Nucula ovata, *pl.* 18, *fig.* 65.

Ref.—Cucullæa ovata. *Sowerby*, Sil. Researches, *pl.* 3, *fig.* 12 *b*.

Character.—Transversely extended to an ovate form, most obtuse towards the anterior side, and having a width greater than the length in the ratio of 3 to 2. Interior lamina directly longitudinal (not oblique), on the anterior side of the beak.

The agreement of this shell with Mr. Sowerby's figure and description above referred to, appears complete. Perhaps the genus may be advantageously changed to Nucula, for in some of the species of that genus the impression of the lamina is similar (Mr. Goldfuss, tab. 124, figs. 4 and 9); and Mr. Sowerby does not mention this impression in some other species which he ranks with Cucullæa. Moreover this impression is on the wrong side of the beak for Cucullæa.

Locality.—In North Devon (?) one small specimen at Pilton (?).

In South Devon: Meadsfoot Sands, near Torquay (laminated sandstone).

Genus. Cucullæa.

The genus Cucullæa is rare in existing nature, very abundant among the strata of middle antiquity, and *perhaps* in the north of Devonshire. Mr. Sowerby has with reason placed in this genus, at least provisionally, the species figured on pl. 19, and I add to them only one, pl. 18, fig. 66, of a more elongated figure, but with the same cardinal area prolonged on each side of the beaks. The fossil Cucullææ do not by any means always shew the internal laminæ which is conspicuous on the *posterior* side of each of the valves in the recent *Cucullæa auriculifera*. Mr. Sowerby has observed its impression in some of the Devonshire specimens.

The specimens which follow are more positively inequivalve than the recent species (though the inequality is slight and irregular), and there is much diversity as to the posterior ridge, and posterior area, which is much more definite in some specimens, and on some valves, than on others. Most examples have undergone, not exactly a displacement, but rather an oblique compression, which makes the figure rather uncertain. I believe this genus occurs in mountain limestone more extensively than the two species which I have referred to it (Geol. of Yorkshire, pl. 5. figs. 19 and 20) might indicate.

66. CUCULLÆA AMYGDALINA, *pl.* 18, *fig.* 66.

Compare Cypricardia amygdalina, Sil. Researches, *pl.* 5, *fig.* 2.

Character.—Obliquely extended to a width double the length; very gibbous anteriorly, attenuated and depressed posteriorly; posterior area defined by an obtuse ridge, surface concentrically marked by lines of growth.

The specimen figured is so much like *Cypricardia amygdalina* of the Silurian Researches, pl. 5, fig. 2 (though of double the size), that but for the very distinct and continuous prolongation anteriorly of its cardinal area, it might be ranked with Mr. Sowerby's shell. The specimen given in the Silurian Researches seems to have some stony matter adherent, in the part before the beaks.

Locality.—In North Devon: Marwood.

67. CUCULLÆA HARDINGII, *pl.* 18 *and* 19, *fig.* 67.

Ref.—Cucullæa Hardingii. *Sowerby*, in Geol. Trans. 2nd Series, vol. v. *pl.* 53, *figs.* 26, 27.

Character.—'Transversely oval, with the posterior side truncated, gibbous, smooth, nearly twice as wide as long, beaks nearest the anterior side.'—(Sowerby, in loc. cit.)

After some hesitation I have ventured to refer the shells represented by fig. 67 to Mr. Sowerby's species, but the state of their conservation is very unfavourable to exact identification.

Locality.—In North Devon: Marwood.

68. CUCULLÆA ANGUSTA, *pl.* 19, *fig.* 68.

Ref.—Cucullæa angusta. *Sowerby*, in Geol. Trans., 2nd Series, vol. v. *pl.* 53, *fig.* 25.

Character.—Squarish, rather wider than long, convex, smooth; anterior side rounded, the posterior truncated, square; beaks central.

'A cast has the impressions of the lateral teeth, which confirm the genus.'—(Sowerby.)

Locality.—In North Devon: Marwood.

69. CUCULLÆA UNILATERALIS, *pl.* 19, *fig.* 69.

Ref.—Cucullæa unilateralis. *Sowerby*, in Geol. Trans., 2nd Series, vol. v. *pl.* 53, *fig.* 23.

Character.—Obliquely ovate, gibbous, smooth; posterior side oblique, flattened; beaks nearest to the anterior side.

In Mr. Sowerby's figure the impression of the laminæ of the posterior muscular impression is marked more distinctly than in the specimens which I have examined.

Locality.—In North Devon: Marwood.

70. CUCULLÆA TRAPEZIUM, *pl.* 19, *fig.* 70.

Ref.—Cucullæa trapezium. *Sowerby*, in Geol. Trans., New Series, vol. v. *pl.* 53, *fig.* 24.

Character.—'Transverse, obtusely trapezoidal, irregularly convex, smooth; anterior side rounded; posterior large, truncated, and longer than the rest of the shell. Length about three-fourths of the width.'—(Mr. Sowerby). My specimen is considerably longer in proportion than Mr. Sowerby's figure, and is altogether much like what a very large specimen of *Cucullæa angusta* might be supposed to be. I have seen no other which resembles the figure and description in the Geological Transactions.

Locality.—In North Devon: Marwood.

The three last species of Cucullæa are so very closely allied, that on looking over many specimens, we find it extremely doubtful whether the differences observed are other than those of degree. The same thing is observable at Marwood, in regard to *Avicula dumnoniensis*, which varies so much in its proportions, as to require the pointing out of three distinct forms.

71. CUCULLÆA DEPRESSA, *pl.* 19, *fig.* 71.

Character.—Oblique, depressed, nearly of equal length and breadth, smooth, with a narrow cardinal area.

The extreme depression of this shell, as compared with those mentioned before, is remarkable, and does not depend on distortion or pressure, but it is very uncertain how much is to be allowed to accidental and local variations of form.

Locality.—In North Devon: Marwood.

It is singular that while in the series of North Devon rocks, generally, the Fenestellæ, Crinoïdea, Brachiopoda, and some of the Mesomyona, have a very extensive distribution, none of the Plagimyona have been found, except toward the western part of the range, as at Marwood, Pilton, Baggy Point.

It seems equally singular that in this small tract, Cucullæa should be so plentiful in the sandy beds of Marwood, and yet be hardly known elsewhere in the vicinity.

CONCHIFERA MESOMYONA,

OR

MONOMYARIA.

Genus. POSIDONIA.

This group of Conchifera is not very clearly defined, but its convenience has ensured a very general adoption. Goldfuss ranks in it several species from the strata of the country of Nassau, and from the Keuper and the Lias. It is probable that *Inoceramus vetustus* of Sowerby's Mineral Conchology, may be included with them, though its valves are more unequal. A slight inequality of the convexity of the valves may, however, be traced in Devonshire specimens, and perhaps would be more striking but for the compression to which they have generally (not always) been subjected. The ridged surface of many specimens is impressed by the ridges of others, without fracture, which appears to shew that the shell was flexible; that it was very thin, is evident upon examining any of the innumerable specimens which fill certain layers of the limestones, and sometimes of the shales at Swimbridge, Venn, Trescot, Lew Trenchard, &c. A minute ridging or puckering is seen in some examples (in shale more especially), which seems not due to any original structure of the shell, but to some oblique contraction in the laminated rocks. Other minute inequalities of surface, rugosities crossing the ridges and furrows at right angles, which appear equally on some German and Devonshire specimens (see fig. 72 *a*), while others in the same surface of stone are not so marked, may possibly be characteristic of a species. It is very difficult, however, to be satisfied with any distinction among the numerous forms which these fossils exhibit, in endless variety. Mr. Sowerby has made the most convenient distribution, at present practicable, and though, among a great number of specimens, some will certainly be found which appear to connect the species which follow into one, and others which might receive a specific name, I am not able to propose any change, which I should think an improvement. Mr. Sowerby's figures are excellent.

The principal repository of Posidoniæ, in Devonshire, is the series of calcareous, shaly, arenaceous, and cherty rocks, which in North Devon range from near Barnstaple through Venn, Swimbridge, and Bampton; and in South Devon pass by Trescot, Lew Trenchard, and Bridestow, to Oakhampton. We also find them in the uplifted and insulated mass of this limestone in the quarries at West Leigh.

In the mountain limestone series of the county of Northumberland, Mr. Sowerby quotes *Posidonia tuberculata; Posidonia Becheri* has been said to occur in the "calp" of Ireland; Goldfuss mentions it in the slaty rocks of Nassau (near Herborn, Ründerath), and in Westphalia (near Beringhausen). Bronn mentions Frankenberg and Edderbringhausen, in Hessia, and Oberschulenberg, near Clausthal, and adds, 'much more widely diffused in the lias.' But the specimens last referred to were supposed by Voltz to be distinct, and have received the name of *P. Bronnii* from Goldfuss. As to the affinities of the genus they are doubtful. M. Deshayes has conjectured that they were thin single plates of the same nature as the lamina of Aplysia, and it is remarkable that no case has come under my notice of a specimen in which the opposite valves were in exactly symmetrical apposition. But Bronn gives a drawing (Leth. Geog. pl. 2, fig. 176,) which implies that he has seen such a one.

72. POSIDONIA TUBERCULATA, *pl.* 20, *fig.* 72.

Ref.—Posidonia tuberculata. *Sowerby*, Geol. Trans. 2nd Series, vol. v. *pl.* 52, *fig.* 5.

Character.—Compressed, obovate, approaching to orbicular, concentrically ridged and marked down the middle with three or four longitudinal ribs, which form more or less distinct tubercles as they cross the ridges. Length not 2¼ inches, width fully 2¾ inches.

I have seen a considerable number of specimens having these characters. In general the concentric ribs on these individuals are fewer than on those which we refer to *P. Becheri*, though in this particular much variation appears. Many young specimens possibly of this species are very irregular in regard to their ridges.

Locality.—In North Devon: Venn; Swimbridge.

73. POSIDONIA BECHERI, *pl.* 20, *fig.* 73.

Ref.—Posidonia Becheri. *Bronn*, Leth. Geog. *tab.* 2, *fig.* 17.
Goldfuss, Petref, *pl.* 113, *fig.* 6
Sowerby, Geol. Trans., 2nd Series, vol. v. *pl.* 52, *figs.* 2, 3, 4.

Character.—'Obliquely ovate, or sub-orbicular, convexo-planate, very thin, biauriculated, with rather regular concentric sharp ribs and parallel striæ in the intervening furrows.'—(Mr. Sowerby.)

The number of ribs varies exceedingly; on the posterior distinct flattened ear they run into fine striæ. Of the varieties of this shell, Goldfuss figures one of an oval shape, not unlike an Anodon; and two others nearly orbicular, in one of which the posterior slope is convex. Mr. Sowerby repeats figures nearly resembling the two former; and Bronn gives another in which the posterior sloping edge is decidedly concave inwards. In respect to the striation between the ribs, this is rarely to be seen with the least distinctness on Devonshire specimens. It sometimes fails on foreign specimens, as I find by an example sent me by my late valued friend M. Voltz. On the same slab is another specimen not only striated between the ribs, but these striæ shew traces of minute and regular granulation.

Locality.—In North Devon: Venn, Swimbridge.

In South Devon: Lew Trenchard; Trescot.

74. POSIDONIA LATERALIS, *pl.* 20, *fig.* 74.

Ref.—Posidonia lateralis. *Sowerby*, in Geol. Trans., *pl.* 52, *fig.* 1.

Character.—'Compressed, transversely elongato-ovate, concentrically ridged; umbones very near the anterior extremity; ridges angular. Width about two-and-a-half times the length, which is 1¾ inch.'—(Mr. Sowerby.)

There is some difference in the proportions of different individuals of this species, which is very abundant in nearly all parts of the range of the limestone of Swimbridge and Bampton, in North Devon, and Lew Trenchard in South Devon. The posterior edge is generally nearly straight, or a little concave, but sometimes a little convex. The smaller figure represents a young shell rather less transverse and less oblique than usual.

Locality.—In North Devon: Venn; Swimbridge; Bampton; West Leigh.

In South Devon: Lew Trenchard; Trescot.

Genus. PECTEN.

75. PECTEN GRANULOSUS, *pl.* 21, *fig.* 75.

Obliquely ovate, with nearly equal ears, depressed; surface minutely reticulated by the crossing of radiating and concentric striæ, so as to assume a very fine granular or cellular aspect.

I place it in the genus Pecten, on account of its nearly equal ears. I have seen only one specimen, which I found in greenish slaty stone in the quarry undermentioned.

Locality.—In Cornwall: Landlake Quarry, near South Petherwin, in slate.

76. PECTEN POLYTRICHUS, *pl.* 21, *fig.* 76.

Character.—Depressed; width twice the length, hinge-line nearly equal to the width, anterior side rounded, posterior angular; surface radiated from the beak, with about twelve sharp conspicuous striæ, between which are several others of unequal lengths and degrees of fineness.

Var. α. The interstitial striæ alternately larger and smaller, and concentrically marked by innumerable fine sharp lines of growth.

β. The interstitial striæ equal.

Very analogous to *P. transversus,* but much less oblique, still wider, and with more of the finer interstitial striæ. It is certainly allied to *Pterinea radiata* of Goldfuss.

Locality.—In North Devon: *α,* Brushford.

In South Devon: *β,* Mudstone Bay.

77. PECTEN TRANSVERSUS, *pl.* 21, *fig.* 77.

Pecten transversus. *Sowerby, tab.* 53, *fig.* 3.

Ref.—Pterinea radiata(?). *Goldfuss, tab.* 119, *fig.* 7.

Character.—Obliquely extended to an ovate form, with a width considerably exceeding the length; very slightly convex;

with nearly equal large expanded flattened ears, defined by a ridge of the shell. Surface beautifully radiated with about 30 principal fine crenated raised striæ, and other shorter and smaller ones alternating with these, so as to make triple radiations. The ears are also radiated, and, like the rest of the surface, crossed by raised lines of growth.

Size.—My largest specimen from Brushford is nearly 2½ inches wide, and if perfect would be nearly 3.

I have very little doubt that this is the same shell which Goldfuss calls *Pterinea radiata,* tab. 119, fig. 7. He figures what in Avicula would be called the upper valve; my figure gives the opposite valve. Having chosen a very perfect specimen, in which the roughness, caused by the transverse striæ makes the ribs appear granulated, I have only to add, that in other specimens this is less conspicuous, and so they come nearer to Mr. Sowerby's and Goldfuss's figures.

Locality.—In North Devon: Pilton; Brushford; Croyde.
In Cornwall: South Petherwin.

78. PECTEN ALTERNATUS, *pl.* 21, *fig.* 78.

Character.—Oval, oblong, not oblique; lower valve convex, with about twelve round (smooth?) ribs, alternately larger and smaller, radiating from the beak to the indented circular margin (ears radiated with much finer elevated striæ: this last character from the cast of the inside only.)

The smoothness of the ribs may be a variable circumstance, but the general air and proportions of the shell render it very distinct.

Locality.—In Cornwall: South Petherwin.

79. PECTEN RUGOSUS, *pl.* 21, *fig.* 79.

Character.—Rather obliquely oval; flattish, with few very prominent sharp ribs, increased in number towards the margin; the interstices concentrically striated.

Though too imperfect to be distinctly characterized, this little shell may probably be recognized again, and better specimens be obtained. I found it in a very bad condition, in black shale, at Babbacombe, at the base of the Torbay limestone.

Locality.—In South Devon: Babbacombe.

80. PECTEN ARACHNOIDEUS, *pl.* 21, *fig.* 80.

Character.—Upper valve obliquely ovate, depressed, with small nearly equal acute (?) ears; surface radiated with broad flat ribs and furrows, crossed by concentric, equal, numerous, distinct lines.

I have seen only one specimen, which, on account of the nearly equal acute ears, is placed in the genus Puten.

Locality.—In Cornwall: South Petherwin.

Genus. PTERINEA.

81. PTERINEA (?) SPINOSA, *pl.* 22, *fig.* 81.

Character.—Deeper valve very convex along the middle, and along the small anterior wing, which is rounded and separated from the middle by a broad and deep sinus and depression; the anterior side flat and widely expanded. Whole surface marked by concentric striæ and radiating ribs, which are large, wide apart, and spinose on the anterior wing, and on the middle of the shell. On the middle of the shell the intercostal spaces are flat, longitudinally and transversely striated, and a similar ornament covers the posterior wing.

Upper valve unknown, except by a cast of the interior.

In general, the resemblance is very great between this fossil and *Pterinea fasciculata,* Goldfuss, tab. 120, fig. 5, which was obtained from the grauwacke of Ems. The ribs of our species being very spinose, and their number on the back less than in Goldfuss's specimens (in his 9 to 12, in ours 5 or 6), besides other characters, appear to distinguish the shells. The upper valve of Goldfuss's shell not being represented, and of our species being only known by the cast of the interior, there is some difficulty as to the genus. The muscular impressions and hinge are those of Pterinea; by the general contour it may be referred to this genus or to Avicula; but Goldfuss expressly states Pterinea to be equivalved, and our shell is certainly not so. There is an obscure appearance of minute denticulation on the posterior hinge line; the teeth under the beak vary in number.

Pterinea costata of Goldfuss, tab. 120, fig. 4, more nearly agrees with our specimens, as to the number of ribs, but its ornamental striation is different, and the ribs are smooth, ours very spinose.

82. PTERINEA VENTRICOSA (?), *pl.* 21, *fig.* 82.

Ref.—Pterinea ventricosa. *Goldfuss*, *pl.* 119, *fig.* 2.

I have seen only a cast of the interior, which is considerably like the species above referred to, except that the anterior hinge grooves are not directed to the mesial line of the shell, but more nearly parallel to the anterior margin.

Locality.—In Cornwall: South Petherwin.

Genus. AVICULA.

83. AVICULA ANISOTA, *pl.* 22, *fig.* 83.

Character.—Lower valve.—Convex, with a prominent beak, transversely extended to a width greater than the length, with very dissimilar wings; the anterior small, round, deeply separated from the body of the shell; the posterior larger, concavely arched and pointed, and gradually united to the body of the shell. Surface radiatingly striated, and concentrically marked by lines of growth. (The striæ are conspicuous chiefly near the beak, the lines of growth most prominent on the posterior wing).

The peculiar appearance of the dissimilar wings of the shell almost induced me to class this fossil with the Pterinea of Goldfuss. It seems to be a well-characterized species, but I have seen only one specimen, which was found with several other rarities. It is probably related to *Avicula ceratophaga* of Goldfuss.

Locality.—In South Devon: at Meadsfoot, in sandy ochraceous shale.

84. AVICULA CANCELLATA, *pl.* 22, *fig.* 84.

Character.—Nearly equivalved; transversely extended to an obliquely ovate or sub-rhomboidal figure, nearly twice as wide as long; posterior area large, triangular (elevated in the middle), appearing as a square projecting ear, and gradually united to the middle surface of the shell (anterior side auriculate rounded), beaks large, convex, prominent near the anterior extremity; hinge line rather shorter than the width of the shell; whole surface very finely and regularly striated from the beaks, and concentrically reticulated by lines of growth.

A very beautiful shell. In a specimen from the grit rocks of Braunston, the cancellation is more distinct than in the fine example figured from Baggy Point. The posterior slope is wholly covered with striations, not bare, as Mr. Sowerby describes *Avicula Damnoniensis*.

Locality.—In North Devon: Baggy Point (limestone); Croyde; Braunston.

85. Avicula rudis, *pl.* 22, *fig.* 85.

Character.—Lower valve.—General figure elongate, with a square short hinge line, and prominent beak near the anterior end; surface covered with flexuous and irregular lines of growth.

Though very indistinctly shewn, this seems too curious a fossil to be omitted from the catalogue.

Locality.—North Devon: Pilton; Brushford.

86. Avicula subradiata, *pl.* 23, *fig.* 86.

Ref.—Avicula subradiata. *Sowerby*, in Geol. Trans., 2nd Series, vol. v., *pl.* 54, *fig.* 1.

Character.—Extended to an oblique semi-elliptical figure, the hinge line being very slightly bent at the beaks. Lower valve convex, upper valve flat; posterior surface ample, united to a wide rectangular wing; anterior surface rounded, very little extended beyond the depressed beaks. Surface concentrically marked with elevated striæ, and along the middle of the shell radiated from the beaks.

This species resembles *Avicula lineata,* Silurian Researches, pl. 5, fig. 10, but as several specimens shew only mesial radiations, this distinctive character is probably constant.

Locality.—In Cornwall: South Petherwin.

87. Avicula texturata, *pl.* 23, *fig.* 87.

Character.—Obliquely ovate, convex, amplified behind, and expanded into a nearly rectangular wing; contracted anteriorly to a short rounded wing. Beaks rather prominent. Surface covered by radiating elevated sharp striæ, which are decussated, especially on the mesial region, by concentric elevated lines.

At the crossing of the striæ, small granulæ appear in perfect specimens. Some specimens are smoother. I have also noticed specimens in which the anterior wing appeared rather acute.

Locality.—In South Devon: Barton; also in Mr. Hennah's collection.

88. AVICULA (?) RETICULATA, *pl.* 23, *fig.* 88.

Character.—Upper valve.—Oblique, convex along the middle, the anterior lobe rounded (?), the posterior one straight, narrow (?). Surface concentrically sulcated, and reticulated by radiating striæ.

Resembles *Avicula ceratophyga* of Goldfuss, which occurs in the Zechstein of Thuringia. It also resembles *Gervillia lunulata* of the mountain limestone of Yorkshire.

Locality.—In South Devon: Newton; Barton.

89. AVICULA EXARATA, *pl.* 23, *fig.* 89.

Character.—Lower valve.—Rather obliquely extended to a width exceeding the length, ears or wings unequal, surface radiated with about eight sharply cut grooves, leaving the intervening spaces smooth and flat.

A very pretty fossil, of which I have seen only two specimens.

Locality.—In Cornwall: South Petherwin.

90, 91, 92. AVICULA DAMNONIENSIS, *pl.* 23, *figs.* 90, 91, 92.

Ref.—Avicula Damnoniensis. *Sowerby*, in Geol. Trans., New Series, vol. v., *pl.* 53, *fig.* 22.

Character.—'Obliquely ovate, with a square projecting ear, very convex, striated; anterior side small, obtuse; hinge-line rather shorter than the width of the shell; beaks large, convex, near the anterior extremity; (posterior slope and ear destitute of the fine longitudinal striæ which ornament the rest of the shell?)'—(Mr. Sowerby).

My figures represent casts, which shew but little of the striation. There are such considerable differences in the forms of the specimens, and other points of character, as to render it desirable to notice three varieties, which may be thus defined:—

90. *Var.* α, elongata: posterior slope and ear and upper valve especially striato-cancellated (more so than the rest of the surface); width two and a half times the length.—(*Fig.* 90.)

92. *Var.* β, media: posterior slope and ear smooth; width double the length.—(*Fig.* 92.)

91. *Var.* γ, abbreviata: general figure obliquely oval; width once and a half as great as the length.—(*Fig.* 91.)

Locality.—In North Devon: Marwood.

CONCHIFERA BRACHIOPODA.

The classification of the numerous fossils of this well-defined group of Conchifera has become very much confused by the entirely different senses in which the same terms are used, and the very different scales upon which generic distinctions are made to rest. The inconvenience of a single term for a vast heap of disagreeing forms has been removed, but there is great fear of our falling into an opposite degree of confusion from the adoption of genera insufficiently examined, or founded on too few examples. One of the earliest steps on right principles of classification was made by the late Mr. Sowerby, in whose celebrated "Mineral Conchology" the three natural groups of Terebratula, Spirifera, and Producta, were found fitting receptacles for a vast multitude of species previously ill distinguished. This simple view of the subject was found to throw great light on geological revolutions. Productæ range from some of the oldest strata to and into the magnesian limestone; Spiriferæ, commencing in as early periods, penetrate the lias; Terebratulæ, equally ancient, are also found through the secondary and tertiary periods, and yet exist. By adopting the many additions proposed by European and American writers, we shall make the whole number of the regular inequivalve genera of Brachiopoda about 20. This, however, is not the practice recommended by Von Buch, Bronn, Blainville, Deshayes, or Sowerby.

Obliged to adopt some distinct principle of classification suited to the fossils of Devon and Cornwall, I have consulted the method of Von Buch, whose labours on the Terebratulæ, Delthyridæ, &c. are of the highest value. The general view which this author proposed may be understood by the following table, extracted from his Memoir, *Uber die Terebrateln,* Berlin, 1834.

BRACHIOPODA.

A.—Attached by the border:—
between the two valves; no hinge 1. Lingula.
at the border of the dorsal valve,
above the hinge.

One valve perforated.	
The perforation separated from the hinge line by a deltidium .	2. Terebratula. Atrypa. Orthis. Strigocephalus. Uncites. Pentamerus. Magas.
The perforation a triangular opening, of which the base rests on the hinge line, and the apex reaches to the apex of one valve	3. Delthyris. Spirifer. Cyrtia. Gypidia.
Neither valve perforated.	
A large cardinal area	4. Calceola.*
No cardinal area	5. Leptæna.† Producta. Strophomena.
B.—Attached by the lower side:—	
Middle of the lower valve perforated for attachment.	6. Orbicula.
Lower valve entire, attached by its whole face	7. Crania.

Of these seven groups, we have yet found in the district under review only Terebratula, Delthyris, Calceola,‡ and Leptæna. By late writers most of the sub-genera mentioned by Von Buch are employed as genera, according to the original views of Sowerby, Dalman, and others. Of these we shall only have occasion to make mention of Atrypa, Orthis, and Strigocephalus.

In regard to Orthis, the existence of a deltidium, separating the foramen from the hinge line, is, in some cases at least, not observable; in others the opening appears actually to enter the opposite (ventral) valve; and generally the affinities of the group, as employed by Murchison, bring it close to Delthyris. The foramen also is in some cases so nearly obtect, and the area often so minute, that it approaches in these particulars to Leptæna. I believe that it should be allowed to include several 'Spiriferæ' mentioned in my work on the Mountain Limestone, and some 'Leptænæ' of the Silurian Researches. With this impression, I have in this work placed, *Leptæna sordida*, of Sowerby, with Orthis, and wish to call attention to its extreme analogy with *L. lata* (Sil. Researches), and a species not yet described, which I have found in the mountain limestone.

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* Supposed to be attached by fibres passing through the straight hinge line.

† Supposed to be attached by a divided muscle on the straight hinge line.

‡ Discovered by Mr. Austen.

Atrypa (so named by Dalman, from its supposed imperforate valves), admitted among the group of Terebratula by Von Buch, is employed very extensively by Mr. Sowerby, in his recent labours on Devonshire fossils (Geol. Trans., New Series, vol. v.), and in fact is made to entirely supplant the name of Terebratula, in the palæozoic strata. In effect, whoever will carefully examine the 'Terebratulæ' of the strata below the lias, will find but few which can be supposed to exhibit a distinct oval or circular opening below the beak (such as belongs to *T. concinna,* for example), and perhaps none which shew a truncated perforate beak (as for example, in *T. maxillata*), structures which are common in mesozoic and cainozoic rocks, as well as in the modern sea.

A very important character, in addition to the structure about the foramen, is the form of the plates, which appear in most of the groups passing inwards from the sides of the foramen. In genuine Terebratulæ these are of the least importance; in the Atrypæ, Orthides, Delthyrides, Strigocephali, and Pentameri, they grow more and more important, and it is often quite indispensable to know their form before pronouncing on a fossil group. On the considerations now presented I drew up the following scheme:—

Brachiopoda.
- Valves free. Attachment by exserted muscle.
- Valves equal . . . . Lingula.
- Valves unequal. Larger valve imperforate (*Athyridæ*).
  - No cardinal area . . . . Producta.
  - A cardinal area . . . . Calceola.
- Larger valve perforated in or under the beak.
- Perforation reaching to the hinge line (*Delthyridæ*).
  - Cardinal area more or less common to both valves . . . . Orthis.
  - Cardinal area confined to the larger valve.
  - Internal plates of the larger valve separate Spirifera.

Internal plates of the larger valve united on the mesial line of the shell.
Plates narrow . . . . . . Strigocephalus[*]
Plates very broad . . . . Pentamerus.
Cardinal area obsolete, beak incurved over a minute perforation, which is often obtect, or merely serves to receive the beak of the smaller valve . . . . Cleiothyris[†]
Perforation not reaching to the hinge line (*Cyclothyridæ*).[‡]
Beak truncate, perforate . . . . Epithyris.
Beak acute, the perforation below it . . . Hypothyris.

I believe this classification, fully developed, would be found to coincide with geological revolutions, and with a natural succession of affinities; but I propose to make at present no use of the new terms which shall embarrass the reader who prefers any other view. Under the head of Terebratula I shall include, with Von Buch, many of the Atrypæ of Dalman and Sowerby, giving this term and Cleiothyris, as synonyms of a part of that great group. Strigocephalus, Orthis, and Spirifera, will be separated. In this latter genus I include the analogues of *Spirifera lineata,* and which seem to conduct naturally to the smooth terebratuliform species, now ranked as Atrypa by Mr. Sowerby.

CONCHIFERA BRACHIOPODA.

Family. ATHYRIDÆ.

Genus. LEPTÆNA, OR PRODUCTA.

Mr. Sowerby having adopted the name of Leptæna, proposed by Dalman, for the group to which, in the "Mineral Conchology," the name of Producta was assigned, it will perhaps become the favoured term. The species ranked under this head in the following pages appear to me to form a natural group, in two sections; the first including the analogues of *Producta depressa* of Sowerby, the second of *Producta antiquata,* &c. If we retain in this genus *Orthis sordida* (pl. 25, fig. 104), and place with it *Orthis interstrialis* (fig. 103), these would make a third group, analogous to *Leptæna lata* and *L. sericea* of Sowerby, conducting to the usual forms of Orthis. At present I prefer to remove them from the Productæ.

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[*] The difference between Strigocephalus and Pentamerus appears to me not very important.

[†] The term Atrypa (*α*—privative, and *τρυπα*—foramen) is objectionable. Cleiothyris (*κλειω*—claudo, *θυρα*—janua) would be preferable, and with the terms Epithyris and Hypothyris might console us for the loss of Terebratula, which in Von Buch's view includes the three groups.

[‡] In the sense of encircled.

93. Leptæna analoga, *pl.* 24, *fig.* 93.

Ref.—Producta analoga. *Phillips*, in Geology of Yorkshire, vol. ii., *pl.* 7, *fig.* 10.

Character.—Semicircular; hinge line extended to narrow ears; front straight or concave. Lower valve gently convex near the beak, flat on the disk, but near the front concentrically and angularly bent toward the upper valve. Surface sub-concentrically corrugated (except upon the bent border) with rounded flexuous continuous wrinkles, which become irregular on the ears, and are everywhere crossed by equal, rounded, filiform, straight, radiating striæ.

Size.—Above one inch in length.

The irregularity of the sub-concentric wrinkles in the Devonshire specimens is sufficient to deter me from referring them to *Leptæna rugosa*, or *L. depressa* of Dalman; the same argument brings them into affinity with *L. analoga*, with which they appear to agree perfectly, except that their intumescence about the beak is more constant. In regard to the interior structure, the resemblance between our specimens and those called *L. depressa* by Dalman is considerable, without being precise. It is to be regretted that this part of the characters of Leptæna has been only slightly regarded, the variations in each species being sometimes great, and those among different species remarkable and striking.

Locality.—In North Devon: Croyde Bay.

94. Leptæna nodulosa, *pl.* 24, *fig.* 94.

Character.—Widely semicircular. Lower valve, concentrically and irregularly angulated near the border, and there rectangularly bent upwards and *broadly undulated*, its disk flat from the beak to the border. Surface irregularly, rather than concentrically ridged and furrowed. Whole surface radiated by extremely *fine flexuous striæ.*

Size.—Above 1½ inch long.

I have been always much disposed to believe this distinct from the last species, and this opinion is rather strengthened by inspecting Mr. Sowerby's figure (Geol. Trans., 2nd Series, vol. v., pl. 56, fig. 3), which represents the same form and characters. The radiating striæ are beyond all comparison finer, and require a lens to be distinctly traced. They are remarkably close, *numerous* and *flexuous*. The front margin shews no *mesial concavity*, (which I find to be generally more distinct in *P. analoga,* than in pl. 7, fig. 10, Geol. of Yorkshire), the reflected border is much undulated, so as to be even nodular, and the concentric rugæ are so very *irregular* and discontinuous as to give quite a different air to the whole. The internal structure is but slightly known; the hinge line is crenulated.

Locality. — In South Devon: Newton Bushel; Hope, near Torquay.

95. LEPTÆNA RUGOSA, *pl.* 24, *fig.* 95.

Ref. — *Dalman,* Swedish Transactions, *pl.* 1, *fig.* 1; *Bronn,* Leth. Geog., *pl.* 2, *fig.* 8; *Sowerby,* Geol. Trans., 2nd Series, vol. v., *pl.* 56, *fig.* 4.

Character.—Semicircular, hinge line extended to short ears, front straight. Lower valve slightly convex, and towards the border angularly bent toward the upper valve. Surface concentrically and regularly wrinkled, except upon the border, with rounded undulations, which are crossed by many equal, filiform, straight, radiating striæ.

Size.—About an inch long.

The three species of Leptæna now described have been often called by the name of *Lept. depressa.* I believe they are all really distinct from that species, but this is a point not easily to be decided until the internal structures and the variations due to age are better known.

Locality.—In South Devon: Newton Bushel.

96. LEPTÆNA CONVOLUTA, *pl.* 24, *fig.* 96.

Character.—Rather semicircular, the hinge line extended into gibbous rounded ears, the middle of the lower valve regularly convex, with a depression between it and the ears. Surface finely and regularly striated from the beak.

I have found a few specimens all much alike, and of about the same size. It is not the young of any other species yet found in this district, but may possibly be the young of *Producta aurita* of the Geology of Yorkshire. In outline it resembles *L. sericea* of the Silurian Researches, pl. 19, fig. 2.

Locality.—In North Devon: Croyde Bay.

97. Leptæna scabricula, *pl.* 24, *fig.* 97.

Ref.—Producta scabricula. *Sowerby*, in Min. Conch., *tab.* 69.
Phillips, Geol. of Yorkshire, vol. ii., *pl.* 8, *fig.* 2.

Character.—Upper valve.—This specimen so perfectly resembles large specimens of *Prod. scabricula* from the so-called millstone grit of Bristol, that I cannot hesitate to apply the same name to it. The figure represents *a cast of the outside* of the upper valve, which was broadly convex along the middle, while the lower valve was there concave. (Some examples from Coalbrook Dale appear almost uniformly convex on the lower valve, but those from Bristol and other places appear always a little concave along the middle.)

Locality.—In North Devon: Pilton; Brushford.

98. Leptæna caperata, *pl.* 25, *fig.* 98.

Ref.—Leptæna caperata. *Sowerby*, Geol. Trans., 2nd Series, vol. v., *pl.* 53, *fig.* 4.

Character.—Oblong, semi-elliptical, hinge line extended to a width rather exceeding that of the rest of the shell. Lower valve extremely and uniformly convex, the other rather concave. Surface concentrically wrinkled, most distinctly so on the sides, and auriform extensions of the hinge; longitudinally undulated on all the middle parts by the elongated bases of numerous slender spines. Hinge line ornamented by long slender spines.

On comparison with good specimens of *Leptæna scabricula*, the most obvious distinction seems to be in the regular strong plain wrinkles on the square ears, the rather greater extension of these, and the uniform convexity of the lower valve.

Locality.—In Cornwall: South Petherwin.
In North Devon: Croyde; Pilton.

99. Leptæna laxispina, *pl.* 25, *fig.* 99.

Ref.—Producta laxispina. *Phillips*, in Geol. of Yorkshire, *pl.* 8, *fig.* 13.

Character.—Hemispherical, hinge line exactly equal to the diameter, margin regular; lower valve regularly convex, without mesial furrow. Surface unequally covered with the elongated bases of attachment of slender spines, which are long and curved on the hinge line.

I know not how better to arrange this fossil than with the mountain limestone species above named, which I formerly ranked as a variety of *L. fimbriata*, but distinguished by a name.

Locality.—In Cornwall: South Petherwin.

100. Leptæna fragaria, *pl.* 25, *fig.* 100.

Ref.—Leptæna fragaria. *Sowerby*, in Geol. Trans., 2nd Series, vol. v., *pl.* 56, *fig.* 5.

Character.—'Hemispherical, with slightly projecting sides, concentrically waved, nearly smooth, pustulated; beak of the convex valve pointed; hinge line shorter than the width of the shell.'—(From Sowerby.)

On comparing several specimens with varieties of *Producta pustulosa* of the Geology of Yorkshire, I find them remarkably similar, if we look at corresponding parts. The full-grown specimens of *P. pustulosa* were thus described:—

'Rotundato-quadrate, hinge line short of the extreme breadth, gibbous, ears angular, furrowed, spineless; transverse undulated wrinkles bearing numerous scattered spines, which become more and more adpressed toward the margin.'

There is also in the mountain limestone an allied form, which I have called *P. rugata*, but of which I have seen fewer examples. Its description was thus given:—

'Orbicular, wrinkled across, with scattered spines.'

It is very possible, as Mr. Sowerby suggests, that they all constitute one species; they, however, must be regarded on that supposition as well marked varieties, and may be thus characterized:—

Species.—*Leptæna pustulosa.*

Surface transversely striated, more or less wrinkled across, except on the sides and ears.

Outline semicircular; ears rather obtuse angled, hinge line short of the full breadth of the shell. Lower valve very convex, without mesial furrow: upper correspondingly concave.

Var. α.—(*Lept. pustulosa,* Phillips, loc. cit., *pl.* 7, *fig.* 15.)

The spines numerous, irregularly arranged on transverse flexuous ridges, which are nearly spineless on the sides and ears. Spine-bases elongated toward the borders, nearly round about the beak.

Var. β.—(*Lept. rugata,* Phillips, loc. cit., *pl.* 7, *fig.* 16.)

The spines distant, irregularly scattered on very irregular transverse wrinkles, their bases mostly round.

Var. γ.—(*Lept. fragaria,* Sowerby, loc. cit., *pl.* 56, *fig.* 5.)

The spines rather distant, sub-quincuncially arranged, on a surface but slightly corrugated across, except on the sides, their bases round and rather large, though the spine itself was probably small.

Locality.—Of *Lept. fragaria.*—In Cornwall: South Petherwin.

In South Devon: Newton Bushel; Hope, near Torquay.

Of *Lept. pustulosa.*—In the North of Ireland, &c.

Of *Lept. rugata.*—In the North of Ireland, &c.

101. LEPTÆNA MEMBRANACEA, *pl.* 25, *fig.* 101.

Character.—Semicircular, very flat and thin, concentrically striated with undulated lines, amongst which are scattered the tubercular bases of small spines. Hinge line spiniferous.

I have seen several specimens with these characters, which probably are sufficient for its recognition. I have not seen it in any other class of deposits, nor from any other districts.

Var. α.—Transverse lines numerous, fig. 101 *a.*

β.—Transverse lines few, fig. 101 *b.*

Locality.—In North Devon: Pilton.

In Cornwall: South Petherwin.

102. LEPTÆNA MESOLOBA, (?) *pl.* 25, *fig.* 102.

Ref.—Producta mesoloba. *Phillips*, Geol. of Yorkshire, vol. ii, *pl.* 17, *fig.* 13.

Compare Leptæna lepis. *Bronn*, Leth. Geog. *pl.* 2, *fig.* 7.
Orthis concentrica. *Munster*, Beitrage, *pl.* 14, *fig.* 19.

I obtained the shell by splitting the white laminated beds of Coddon Hill, and should have referred it to *Leptæna lepis* of Bronn, but for the circumstance related to me by M. De Verneuil, that in *well preserved* specimens of *L. lepis* from the Eifel, striæ radiating from the beak, of which a few are more prominent than the rest, appear constantly. In one specimen which I have examined from the Eifel, there is no apparent striation. The general figure of my specimens, as far as can be seen, is that of the Eifel shell. I have a small specimen apparently not different from the figure, from the Queen's County limestone, and this being regarded as an example of a variation of *Prod. mesoloba,* I am disposed to assign the same name to my small Devonshire specimen; for though the mesial hollow is not observable, this is a variable character in young shells.

Character.—Wider than long, ears obtuse-angled; surface smooth, or slightly wrinkled across, with or without a few scattered spines; (a mesial ridge on the convex, and a corresponding furrow on the other valve.)

Locality.—In North Devon: Coddon Hill.

Family. DELTHYRIDÆ.

Genus. ORTHIS.

This genus abounds in the lower palæozoic strata (*see* Murchison's Silurian Researches), but becomes comparatively rare in the upper parts of the mountain limestone series, and is unknown to me in the magnesian limestone, or in the more recent strata.

Section 1.—*Leptænoid Orthides.*

103. ORTHIS INTERSTRIALIS, *pl.* 25, *fig.* 103.

Character.—Semicircular; one valve very uniformly convex; the other valve flat; surface marked by sharp striæ, radiating from the beak, of unequal length, or divaricating; between these striæ are others much finer, and four or five times as numerous, also reaching the margin. (On the flatter valve it appears that the striæ, conspicuous and elevated toward the beak, change into furrows toward the edge.—*See* fig. 103.)

In general appearance it resembles *L. sericea* (Silurian Researches, pl. 19, fig. 1), but by comparison of specimens it appears to be quite distinct. See also *L. transversalis* (Sil. Res. pl. 13, fig. 2), which appears to have transverse not longitudinal interstitial striæ, but is otherwise considerably similar.

Locality.—In South Devon: Barton.

104. ORTHIS SORDIDA, *pl.* 25, *fig.* 104.

Ref.—Leptæna sordida. *Sowerby*, in Geol. Trans., 2nd Series, vol. v., *pl.* 53, *fig.* 16.

Character.—Semi-elliptical, very depressed, the upper valve flat, with a slight mesial swelling; the lower gently convex, with a corresponding mesial hollow (on the cast often a deep longitudinal mesial slit.) Hinge area very narrow; surface covered with striæ, which become rugose toward the margin, and were there (and probably on the hinge line) furnished with minute hair-like spines.

The hinge line, in perfect specimens, is squarely ended, or even runs out a little into an angle beyond the general semi-elliptical contour. The change of the character of the striæ near the edge makes the shell appear bordered.

This species can scarcely be distinguished from some fossils found on the lower Avon, near Bristol, by Mr. Stutchbury and Mr. Sanders, and by myself in Yorkshire. These are spinose on the hinge line, as *Lept. lata*; others occur at Meadsfoot, near Torquay, which probably are identical. The bordering of the shell is most distinct in the Bristol specimens, least so in those from Yorkshire; from both of these localities the specimens are wider than those from Linton.

Locality.—In North Devon: at Linton, in hard schist.

In South Devon: Meadsfoot Sands, near Torquay.

Section 2.—*Elliptical Orthides.*

105. ORTHIS LONGISULCATA, *pl.* 26, *fig.* 105.

Character.—Transversely elliptical, depressed, radiatingly striated, with concentric imbrications. Striæ very numerous, fine, divaricating; internal plates near the beak of the lower valve, long, diverging.

If my views be correct, the sides of this species are rounded, so as to make its whole contour elliptical, as in *O. lata,* (Sil. Researches. The long straight diverging subrostral plates appear to be constant. I have seen innumerable specimens at Watersmeet, Linton, and Woodabay, but almost always obliquely crushed. The striæ are much finer than in the elliptical species from Petherwin, to be noticed next.

Locality.—In North Devon: Linton; Watersmeet; Woodabay; West Lee.

106. ORTHIS INTERLINEATA, *pl.* 26, *fig.* 106.

Ref.—Orthis interlineata, in part. *Sowerby,* in Geol. Trans., 2nd Series, vol. v., *pl.* 54, *fig.* 14.

Character.—Transversely elliptical, very depressed; hinge line about half the breadth of the shell. Surface radiated with numerous filiform striæ of unequal length, or frequently divaricating. Subrostral plates of the deeper valve arched so as to include a cordiform space, narrowed toward the beaks.

After much consideration, it has appeared necessary to distinguish this remarkably wide shell from the specimens here called *Orthis parallela,* which is certainly allied to it. Mr. Sowerby's description and figures, taken together, seem to include them both. The remarks of this able palæontologist on the relation of these fossils to the Silurian species, *O. lata, O. orbicularis,* and *O. canalis,* are interesting. Previous to reading them I had referred this species to *O. lata,* but I have not obtained sufficient specimens of that fossil to justify a persistence in this opinion, after seeing the observations of the naturalist who has had the best means of studying the Silurian Brachiopoda.

The specimens which I have seen of the Cornish shell are numerous, perfect, and various.

Whether all the forms represented from exceedingly young specimens (fig. 106 *c, d, e, f,* and *g*), should be referred to this species, is doubtful. I wish to rank 106 *c* (magnified in *d*), and 106 *e* (magnified in *f*), with it; but 106 *g* (magnified in *h*), is perhaps more allied to *Orthis flabellulum,* but it must be recollected that the boldness of its style (106 *h*) is due to the *enlarge-*

ment of scale, and would not have appeared on a *specimen of the same magnitude* as the enlarged figure.

Locality.—106 *a, b.*—In Cornwall: South Petherwin.
In North Devon: Croyde.
106 *c, d.*—In North Devon: Croyde.
106 *e, f.*—In South Devon: Combe.
106 *g, h.*—In South Devon: Combe.

107. ORTHIS ARCUATA, *pl.* 26, *fig.* 107.

Character.—Elliptical, very flat; one valve uniformly convex, the other hollowed along the middle; whole surface very finely striated, the striæ divergingly arched on the sides.

Var. α.—The sulcated valve flat.

β.—The sulcated valve convex on each side of the mesial sulcus.

The figure, and remarkably arched very fine striæ appear to distinguish it from *O. interlineata.*

Locality.—In South Devon: Hope, near Torquay.

108. ORTHIS PLICATA, *pl.* 26, *fig.* 108.

Ref.—Orthis plicata. *Sowerby,* in Geol. Trans., 2nd Series, vol. v., *pl.* 53, *fig.* 10.

Character.—Transversely elongated to a rather elliptical figure; depressed, radiated, with many sharp concentrically striated plaits, which in full-grown specimens divaricate.

The extremity of the hinge line is more or less rounded; least so, or not at all, in young, most so in old specimens.

Locality.—In South Devon: Meadsfoot Sands; Combe, near Ashburton.

In North Devon: Barnstaple; Brushford.

Section 3.—*Orbicular Orthides.*

109. ORTHIS PARALLELA, *pl.* 26, *fig.* 109 *a, b, c, d.*

Character.—Oblong, sub-oval, very depressed, broadest near the front margin, slightly tumid on the mesial line of the deep valve, and somewhat hollowed on the other. Surface radiated with numerous (sharp) striæ of unequal length and size, crossed by lines of growth. Hinge line about half the breadth of the shell; the subrostral ridges of the deep valve remarkably lengthened and nearly parallel, so as to include a very long divided oval space.

These characters appear in several specimens from different places in Devon and Cornwall, and also in some fossils from North Wales, which however have stronger radiating striæ. They agree in almost every respect with Mr. Sowerby's description of *O. interlineata,* but the best figures which he gives for that species (pl. 54, fig. 14), belong to the widely elliptical species already noticed.

Locality.—In North Devon: Pilton; Brushford.

In Cornwall: South Petherwin.

110. Orthis lens, *pl.* 26, *fig.* 110 *a, b.*

Character.—Orbicular, very flat, valves equally convex; radiated with about 20 undulated striæ narrower than the intervening spaces, which are transversely striated, and sometimes (110 *b*) carry an intervening stria. The lower valve has a mesial sulcus near the beak, prolonged into a flat space toward the margin.

Locality.—In South Devon: Hope, near Torquay.

111. Orthis granulosa, *pl.* 26, *fig.* 111.

Character.—Orbicular, very depressed, lenticular, the hinge line above half the width of the shell. Surface radiated with numerous fine granulated striæ, of unequal length, doubled in number, and diminished in prominence, toward the margin (so as to give it rather a bordered appearance.)

Locality.—In North Devon: Woodabay.

In South Devon: Meadsfoot Sands.

Section 4.—*Semicircular Orthides.*

112*. Orthis semicircularis, *pl.* 58, *fig.* 112*.

Ref.—Orthis semicircularis. *Sowerby,* Sil. Researches, *pl.* 21, *fig.* 7.

By comparing the drawings referred to, no doubt will, I think, remain that the specimens belong to one type and species. It would appear that the shell was internally nearly smooth, except toward the margin, where the plaiting is conspicuous. There are more plaits in my fossil than in Mr. Sowerby's drawing.

Locality.—In North Devon: Pilton. One specimen only seen.

112. Orthis compressa (?), *pl.* 26, *fig.* 112.

Ref.—Orthis compressa. Sil. Researches, *pl.* 22, *fig.* 12.

Character.—'Lenticular, compressed, with a straight hinge line; striato-punctate through its whole substance.'—(From Sowerby.) Length to the breadth, as 10 to 12.

There are concentric undulations; the striæ are exceedingly fine, and of unequal lengths; the subrostral plates are short, thick, and very diverging. I have little doubt the reference to the Silurian species is correct; but it must be owned that certainty is hardly to be expected until many specimens have been examined.

Locality.—In North Devon: Linton, 112 *e, f.*
Croyde, 112 *a, b, c, d.*

Section 5.—*The lesser valve most convex.*

The three species next to be noticed are ranked as Orthides by modern writers, and, I am disposed to think, with reason.

113. Orthis crenistria, *pl.* 27, *fig.* 113.

Ref.—Spirifera (?) crenistria (?). *Phillips*, in Geol. of Yorkshire, vol. ii., *pl.* 9, *fig.* 6.
Sowerby, in Geol. Trans., 2nd Series, vol. v., *pl.* 57, *fig.* 7.
Orthis umbraculum (?). *Von Buch.*

Character of specimens from Hope, near Torquay.—Depressed, larger valve somewhat ridged toward the beak, or rather the obtuse-angled apex of the cardinal area, which is broad, flat, and reticulated, and has a short wide mesial elevation (in place of a foramen), generally wholly or partially closed. Lesser valve semicircular or semielliptical; the hinge line equal to, or rather exceeding the greatest width, and ending acutely. Surface striated with diverging dichotomous striæ; the intervening spaces transversely striated.

Though I have never been quite satisfied that this is exactly identical with the shell figured in my work on the mountain limestone, it is so very much and obviously related to it, that I cannot venture to separate them. Specimens which are in Mr. Hennah's collection seem to me rather more like my figure above referred to, than those which I gathered at Hope, near

Torquay. In this latter situation they are rather plentiful, and generally shew a more acute termination to the extended hinge line than in the other examples. The specimens from the South of Ireland are not unlike those of Torquay.

As the larger valve is much the least convex, and the area between the beaks wide, reticulated, and marked with a central (often obtect) foramen, it is surely but little related to Leptæna, but very decidedly to Orthis. After looking carefully at my specimens from Torquay, I am induced to suppose the beautiful little shell, named by Mr. Sowerby *O. tenuistriata,* is the young of this species.

Locality.—In South Devon: Plymouth; Hope, near Torquay; Dartington.

114. ORTHIS ARACHNOIDEA, *pl.* 27, *fig.* 114.

Ref.—Spirifera arachnoidea. *Phillips,* in Geol. of Yorkshire, vol. ii., *pl.* 11, *fig.* 4.

Character.—Oblong, truncato-elliptical, or truncato-orbicular, lesser valve convex. Hinge line equal to the full width of the shell. Surface radiated with many sharp continually subdivided striæ, arched near the hinge.

I have obtained a few specimens from Hope, near Torquay, which appear referrible to this pretty species. Near the beak, a small number of the striæ rise to be more conspicuous than the rest. The figure represents the lower valve.

Locality.—In South Devon: Hope, near Torquay.

115. ORTHIS RESUPINATA, *pl.* 27, *fig.* 115.

Ref.—Terebratula resupinata. Min. Conch., *tab.* 325.
Spirifera resupinata. *Phillips,* Geol. of Yorkshire, vol. ii., *pl.* 11, *fig.* 1.
Spirifera striatula (?). *Schlottheim.*

Character.—Tranversely elliptical; larger valve undulated, its lateral margin often reflected; lesser valve generally flattened in the middle, more convex than the other valve; surface radiated with fine striæ, which rise at intervals to prominent spinous lines.

There is certainly some difference of aspect between the Devonshire specimens represented, and the more shapely and elegant shells common in the mountain limestone. I cannot, however, think them really distinct. In both, the short area is partially extended over each valve. I have seen an Eifel shell, certainly identical with our Devonshire specimens.

Locality.—In South Devon: Barton; Newton.

Genus. SPIRIFERA, or DELTHYRIS.

Though it is not only in this group of Brachiopoda that the spiral appendages appear, they are in none more remarkable; and as the name Spirifera is still retained in a very large proportion of English works, it is here employed as the earliest, and leading to no practical inconvenience.

116. SPIRIFERA MICROGEMMA, *pl.* 27, *fig.* 116 *a*, *b*.

Character.—Sub-orbicular, rather depressed, with a slight mesial undulation (convex on the lesser valve). Surface thickly and finely striated from the beaks, the striæ being crossed by the rather conspicuous edges of many laminæ of growth; at the intersections of these two sets of lines are minute regular round eminences.

The analogues of this species are fossils of the mountain limestone, viz., *Sp. imbricata*, *Sp. mesoloba*, &c. Having collected two agreeing specimens from different districts, I am desirous of calling attention to it, as at least a definite and delicate variety of *Sp. imbricata.*

Locality.—In North Devon: Brushford.
In South Devon: Hope, near Torquay.

117. SPIRIFERA OBLATA, *pl.* 27, *fig.* 117, and *pl.* 28, *fig.* 117.

Ref.—Spirifera oblata. Min. Conch., *tab.* 268.

Character of the Devonshire specimens.—Wider than long, sub-rhomboidal, with very rounded angles, the beak of the lower valve prominent. Mesial fold very broad; surface obscurely radiato-sulcate.

Hardly any genus of shells is more difficult to subdivide than Spirifera, and the group which includes *Sp. oblata*, *Sp. glabra*, *Sp. mesoloba*, and others, is one of the most embarrassing.

If we were to take Bronn's figure (Leth. Geog., tab. 2, fig. 16) as a type of this species, the Devonshire fossils would not be referred to it, on account of its very minute cardinal area and closely incurved beak. They seem to agree more closely with Mr. Sowerby's original figure.

There is a small specimen in Mr. Austen's collection somewhat different, as it has no lateral radiations.

Locality.—In South Devon: Newton Bushel.

118. SPIRIFERA PROTENSA, *pl.* 28, *fig.* 118.

Character.—Much wider than long, sub-rhomboidal, with rounded angles; the wide mesial fold prominent on the front. Hinge area ample, much extended laterally, closely and finely striated across. Surface of the valves distinctly radiated with obtuse large sulci.

I distinguish this from *Sp. oblata* of Sowerby's Min. Conchology, by the remarkably large extended and striated area; the radiating sulci are also more distinct.

Locality.—In Cornwall: South Petherwin.

119. SPIRIFERA UNGUICULUS, *pl.* 28, *fig.* 119.

Ref.—Atrypa unguiculus. *Sowerby*, in Geol. Trans., 2nd Series, vol. v., *pl.* 54, *fig.* 8.

Character.—'Hemispherical, rather wider than long, with an inflated beak, smooth; front emarginate, lower valve very convex, its beak channelled; upper valve flat, with a central impressed line.'—(Mr. Sowerby's description.)

I had named it *Sp. divisa,* before seeing Mr. Sowerby's description. There are two varieties, one (var. α) with only the *beak* of the lower valve channelled: Mr. Sowerby has described this. The other (var. β), with both valves similarly and equally channelled to the edge, where the channels widen; the former variety appears to be largest. I have seen a shell which is perhaps a third variety, with only the marginal parts of the shell channelled. The figures are from casts.

Locality.—In Cornwall: South Petherwin.

In North Devon: Pilton; Brushford.

In South Devon: Barton.

120 *a*. SPIRIFERA LINEATA, *pl.* 28, *fig.* 120 *a*; and *pl.* 58, *fig.* 120*.

Ref.—Terebratula lineata. Min. Conch., *tab.* 335.
Spirifera lineata. Geol. of Yorkshire, vol. ii., *pl.* 10, *fig.* 17.

Character.—Transversely elliptical; convex, without mesial fold; beaks remote; surface concentrically undulated with continuous raised small ridges, across which run fine interrupted longitudinal lines, producing a minute crenulation or even granulation.

Locality.—In Cornwall: South Petherwin; Landlake.

120 *b*. SPIRIFERA DECUSSATA, *pl.* 28, *fig.* 120 *b, c, d, e.*

Ref.—Atrypa decussata. *Sowerby*, in Geol. Trans., New Series, vol. v., *pl.* 54, *fig.* 5.

Character.—Circular, uniformly convex; beaks closely incurved, approximate; surface concentrically and rather sharply striated, and radiated from the beaks by very fine interrupted lines, which produce a minute crenulation. In some cases the concentric striæ are equal (120 *e*); others shew every third or fourth larger.

Probably very analogous to *Terebratula concentrica,* Von Buch, which is sometimes erroneously figured as having a round aperture in the beak.

Locality.—In North Devon: Brushford; Baggy Point; Pilton.

121. SPIRIFERA PLEBEIA, *pl.* 28, *fig.* 121.

Ref.—Atrypa plebeia. *Sowerby*, in Geol. Trans., New Series, vol. v., *pl.* 56, *figs.* 12, 13.
Terebratula subcurvata. *Munster*, Beitrage, *pl.* 14, *figs.* 4, 5, 6.

Character.—'Tranversely obovate, with a produced front, smooth, not very convex; front slightly elevated, *without a depression* in the lower valve; beak but little prominent.'—(Mr. Sowerby's description.)

Mr. Sowerby thinks the smallness of the beaks and the regular convexity of the lower valve distinguish this from the young of *Sp. glabra.* In the few specimens which I have consulted the beaks are somewhat larger and more tumid than in Mr. Sowerby's figure, yet it can hardly be supposed they belong to different species.

Locality.—In South Devon: Barton.

122. SPIRIFERA HIRUNDO, *pl.* 28, *fig.* 122 *a*, *b*, *c*.

Character.—The very singular fossil represented by the above figures is above four times as wide as long, with blunt or truncated ends, and, as far as can be known, a smooth surface. The beaks are approximate, and the cardinal area seems to be very narrow, or a mere line.

Having seen nothing else like it, and only one specimen being known, we can only indicate its occurrence, and trust to future collections for further particulars. It is slightly compressed, but not so as to affect its general form or distinctness of character.

Locality.—In South Devon: Hope, near Torquay.

123. SPIRIFERA PHALÆNA, *pl.* 28, *fig.* 123.

Character.—Transversely elongated, with rounded sides, a prominent beak, and deep broad mesial furrow on the larger valve. No radiating striæ are clearly seen, but the surface (wherever perfect) is regularly traversed by continuous equidistant small ridges and furrows.

But for the bold broad dorsal furrow, I could have admitted this as a specimen of *Terebratula concentrica*, Von Buch. In the drawing the striation is restored on some parts, which in the specimen are imperfect.

Locality.—In South Devon: Hope, near Torquay.

124 *a*. SPIRIFERA SIMPLEX, *pl.* 29, *fig.* 124 *a*, *a*, *b*, *c*, *d*.

Character.—Obtusely pyramidal, or converging to the beak of the larger valve (the angle there is 90°); cardinal area very large, triangular, mesial fold with obtuse borders. Triangular foramen narrow, reaching to the beak of the larger valve. Lesser valve convex.

As far as I have seen, the specimens, both at Plymouth and Newton, are entirely devoid of lateral radiating plaits. This is, I think, seldom, if ever, found to be the case with any specimens resembling *Sp. cuspidata*, found in the mountain limestone. It is certainly not a variety of that species, but is remarkable and probably constant in form. Since the figures were drawn, Mr. Austen has furnished me with more perfect specimens, one of which is represented on pl. 60, fig. 124.

Locality.—In South Devon: Plymouth; Newton.

124 β. SPIRIFERA CUSPIDATA, *pl.* 29, *fig.* 124 β.

Ref.—Spirifera cuspidata. *Sowerby,* Min. Conch., *tab.* 120 and 461.
Phillips, Geol. of Yorkshire, vol. ii., *pl.* 9, *fig.* 1, 4.

Character.—Tetrahedral, wider than long; cardinal area very large, the angle at the beak of the larger valve about 100°; mesial fold plain; lateral plaits 6 or 7.

The specimens represented appear to contain all the characters of the remarkable species to which they are referred: but I am not in possession of any individuals so young from any other locality, nor have any of larger dimension been yet mentioned from this district.

Locality.—In South Devon: Barton.

125. SPIRIFERA HETEROCLITA, *pl.* 29, *fig.* 125.

Syn.—Calceola heteroclita, *Auct.*

Character.—General figure acutely pyramidal, or converging on four faces to the beak of the lower valve, the area below the beak being the widest of the four, and the smaller valve forming a rounded base to the figure. Foramen remarkably long and narrow, and often obtect. Mesial fold broad, in the larger valve very defined, with 4 or 5 lateral obtuse radiating plaits, transversely striated.

The beaks are often bent irregularly, backward or forward.

The specimens from the Eifel correspond precisely with those which I have seen from Devonshire.

Locality.—In South Devon: Barton; Newton.

126. SPIRIFERA SUBCONICA, *pl.* 29, *fig.* 126.

Ref.—Spirifera subconica. *Sowerby,* in Geol. Trans., 2nd Series, vol. v., *pl.* 57, *fig.* 10.

Character.—The principal difference between this fossil and *Calceola heteroclita* is in the comparative shortness of the larger valve and the *narrowness of the mesial fold.* The middle line of the larger valve is convex, and the large area flat. The lateral plaits are about 5, in one case 6.

It occurs in the Eifel.

Locality.—In South Devon: Barton.

127. SPIRIFERA DISTANS, *pl.* 29, *fig.* 127.

Ref.—Spirifera distans. *Sowerby*, in Min. Conch., *tab.* 494, *fig.* 3 *r.*

Character.—Lower valve prominent beyond the upper, and incurved over a broad nearly flat area. Hinge line ending in rather acute angles, but not in attenuated points. Mesial fold narrow, very distinctly defined. Surface radiated with many equal entire ribs and furrows, except upon the mesial ridge of the upper valve.

It seems to agree perfectly with Mr. Sowerby's description and figure, and with a specimen which I possess from the mountain limestone.

Locality.—In South Devon: Barton; Hope, near Torquay.

128. SPIRIFERA CALCARATA, *pl.* 29, *fig.* 128.

Ref.—Spirifera calcarata. *Sowerby*, in Geol. Trans., vol. v., *pl.* 63, *fig.* 7.

Character.—Semicircular, convex; cardinal area narrow, striated across, concave, with nearly parallel edges, extended into very acute, often attenuated ears; mesial fold narrow, very well defined on each valve, and on the larger one by a prominent ridge; surface radiated with many sharp entire ribs, equal in all parts except on the mesial fold, where they are smaller, or even almost disappear. In good specimens sharp transverse striæ appear—fig. 128 *b.*

Var. α. The mesial fold almost clear of striæ—fig. 128 *c.*

β. Mesial fold constantly striated—fig. 128 *a, d, e,*

γ. Mesial fold indistinctly defined—fig. 128 *f, g, h.*

On comparing this beautiful species with *Sp. attenuata* of the mountain limestone of Yorkshire (a most variable shell), we find the ribs generally more distinct and sharp, especially those which bound in a prominent manner the meso-ventral sulcus, and those on the meso-dorsal ridge smaller.* On comparing with *Sp. aperturata,* these very differences from *Sp. attenuata* become agreements; but the lateral ribs are more numerous than in *Sp. aperturata,* the general figure is much wider, and the cardinal area has parallel sides, while in the Rhenish species it is obtusely triangular. In our opinion the resemblance to *Sp. Verneuillii* is greater than to *Sp. attenuata* or *Sp. aperturata.* In the specimens of *Sp. Verneuillii* which we have examined, the ribs are equal on the mesial fold and on the sides.

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* The Irish specimens have finer radiations, but the mesial fold is not so *defined* as in *Sp. calcarata.*

Locality.—In Cornwall: South Petherwin.

In North Devon: Saunton; Pilton; Baggy Point, Croyde.

129. SPIRIFERA DISJUNCTA, *pl.* 29, *fig.* 128 *f, g, h,* and 129; *pl.* 30, *fig.* 129.

Ref.—Spirifera disjuncta. *Sowerby*, Geol. Trans., New Series, vol. v., *pl.* 54, *figs.* 12, 13; *pl.* 55, *fig.* 2.

Compare also Spirifera attenuata (Irish specimen), Min. Conch., *tab.* 493.

Character.—Semicircular, very convex, broadly emarginate in the middle of the front, with a broad cardinal area, striated across, and extended into short acute ears. Mesial fold broad and deep, but indefined at the borders. Surface radiated with many (entire, divaricating, or duplicate toward the edge) small ribs.

Variations as to figure:—

1. Not much wider than long, Geol. Trans., pl. 54, figs. 12, 13.
2. Very much wider than long, pl. 29, fig. 129 supra; Geol. Trans., pl. 55, fig. 2.

Variations as to depth of the mesial fold:—

3. Shallow, pl. 29, fig. 128 γ, *f, g, h.*
4. Deep, pl. 29, fig. 129 *c.*

Variations as to the radiations:—

5. Radiations of equal length, Geol. Trans., pl. 55, fig. 2; pl. 29, fig. 128 γ.
6. Radiations duplicate toward the margin, pl. 29, fig. 129 *a*; pl. 30, fig. 129.

The essential distinctions from *Sp. calcarata* appear to be the indistinctly bordered mesial fold, wider cardinal area, and greater convexity. The variety marked No. 5 is perhaps identical with *Sp. Verneuillii;* Bulletin de la Soc. Geol. de France, tome xi., pl. 2, fig. 3. The character of equality of the ribs, if taken to be of specific importance (according to the views of some continental geologists), would require a separation of fig. 129 *a*, *b*, and the remainder might perhaps be all referred to *Sp. Verneuillii.* I found abundance of specimens at South Petherwin (where *Sp. calcarata* is rare), and, on the contrary, few or no traces of it in North Devon (where *Sp. calcarata* abounds). It has rarely occurred to me in South Devon, and perhaps not at all in any other district of England. *Spirifera attenuata* certainly approaches to it, more especially the Irish specimens, from which it appears but very slightly different, much less so than from *Sp. calcarata*.

Locality.—In Cornwall: South Petherwin.
In South Devon: Hope, near Torquay; Yealmpton.
In North Devon: Baggy Point.

130. SPIRIFERA GIGANTEA, *pl.* 30, *fig.* 130.

Ref.—Spirifera gigantea. *Sowerby*, Geol. Trans., New Series, vol. v., *pl.* 55, *fig.* 1.

Character.—Semi-elliptical, the hinge line being the conjugate axis: mesial fold broad, defined, indistinctly furrowed or nearly smooth, sides with about 25 continuous entire plaits radiating from the beak to the edges, and crossed by conspicuous lines of growth.

One of the largest Spiriferæ known, reaching to six inches, and even more, in diameter. The specimen figured shews, more clearly than any other which I have seen, the principal points of structure, and these certainly make it approximate to the next smaller species.

A beautiful specimen of the spiral appendage of this shell was found compressed in the slaty rock of South Petherwin, and in this state imagined to be a bivalve shell; but by removing a little more of the soft slate around the concave hoops of the spiral, their continuity is sufficiently apparent.

Locality.—In Cornwall: Tintagel, in slate, *on the laminæ* of *cleavage, and deposition,* here coincident; South Petherwin.

131. SPIRIFERA GRANDÆVA, *pl.* 30, *fig.* 131.

Character.—Outline semi-elliptical, or, including the beak of the larger valve, sub-pentagonal, the hinge line being extended a little beyond the elliptical curve into squarish wings; lesser valve having the mesial fold very well defined by two distinct furrows; lower valve with a prominent beak; whole surface radiated with obtuse ribs, which are about 10 in number on each side of the fold. Decidedly allied to *Sp. gigantea* (*supra*), but with only half its number of lateral ribs; more nearly related to *Sp. aperturata* of Bronn (Leth. Geog., pl. 2, fig. 13), but in that fossil the mesial ribs are *smaller* than those on the sides; probably quite distinct from *Sp. bisulcata* (Geol. of Yorkshire, vol. ii., pl. 9, fig. 14,) by its fewer radiations, always very entire.

Locality.—In Cornwall: South Petherwin.

132. SPIRIFERA OSTIOLATA, *pl.* 30, *fig.* 132.

Ref.—Terebratula ostiolata. *Schlottheim, pl.* 17, *fig.* 3.
Spirifera ostiolata. *Bronn, pl.* 2, *fig.* 14.

Character.—Subcircular or subrhomboidal, convex, cardinal area large, rather triangular, concave, extended to angular ears. Mesial fold wide, very well defined, entirely deprived of ribs on both valves. Sides radiated with about 15 strong rounded equal undivided ribs.

Mr. Sowerby mentions in regard to *Sp. distans*, a freedom from plaits on the middle elevated lobe. His figure shews plaits in the corresponding mesial sulcus; and I have seen specimens which corroborate his account in all respects. There are, however, others in the mountain limestone of Yorkshire, very like the same species, which have both sulcus and lobe plain. But in *Sp. distans* the edges of the mesial sulcus are *obtuse*, and the lateral plaits more numerous.

The figure in Schlottheim agrees much more closely, though it appears to mark a wider shell. Finally, *Spirifera ostiolata* of Bronn and Schlottheim, if judged by the figures of either of these authors, is so much like the present species, that, allowing for the variations to which all of this type are subject, we may venture to give them the same name. The Devon shell has apparently the beaks more removed than one of Bronn's figures leads to suppose. It is by mistake that Bronn refers to *Sp. pinguis* of Sowerby as a synonym.

A variety (?) with only 6 lateral plaits on each side occurs at Woodabay, near Linton, in North Devon. Such a one is also mentioned by Bronn in the Eifel limestone. My specimens were not good enough to be figured. Comparison may be made with *Sp. Bouchardi* of De Verneuil; Bulletin de la Soc. Geol. de France, tome xi., pl. 2, fig. 5.

Locality.—In North Devon: Valley of Rocks; Linton.

133. SPIRIFERA APERTURATA, *pl.* 30, *fig.* 133.

Ref.—Terebratula aperturata. *Schlottheim, pl*17, *fig.* 1.
Spirifera aperturata. *Bronn,* Leth. Geog., *pl.* 2, *fig.* 13.

Only one specimen has occurred to our observation, from the coarse slaty rocks of Linton.

It may be viewed as identical with the fossil of Bronn and Schlottheim, though there is a rather nearer approach to equality between its mesial and lateral ribs.

Locality.—In North Devon: Linton.

134. SPIRIFERA COSTATA, *pl.* 30, *fig.* 134.

Ref.—Spirifera costata. *Sowerby,* in Geol. Trans., New Series, vol. v., *pl.* 55, *figs.* 5, 6.

Character.—Transversely elongated to a fusiform shape and a sharp extremity; valves radiated with cord-like ribs transversely striated; the mesial fold narrow, without plaits. The transverse striæ very conspicuous in good specimens.

This certainly resembles *Sp. speciosa* of Bronn, Leth. Geog., tab. 2, fig. 15 (which is not quite like *Tereb. speciosa,* Schlott. pl. 16, fig. 1.); but its lateral ribs are so much more decided, even in a cast, that it appears distinct. It seems also nearly allied to *Sp. undulata* (Sowerby), from the magnesian limestone of East Thickley.

Locality.—In South Devon: Meadsfoot Sands; Hope, near Torquay.

134*. SPIRIFERA SPECIOSA, *pl.* 58, *fig.* 134*.

Ref.—Spirifera speciosa. *Bronn,* Leth. Geog., *tab.* 2, *fig.* 15.

I found specimens which may be ranked with this species at Hope, near Torquay.

135. Spirifera obliterata, *pl.* 31, *fig.* 135.

Semicircular, more than twice as wide as long, very convex, with extended acute terminations to the cardinal area. Surface radiated with rounded very little prominent undulations, crossed by distinct lines of growth. Mesial sulcus slight, placed between two obtusely convex radiations much larger than the rest.

Allied to *Sp. speciosa*, and the species ranked with *Sp. rhomboidea*, *Sp. fusiformis*, &c., in the mountain limestone.

Locality.—In North Devon: Brushford.

136. Spirifera rudis, *pl.* 31, *fig.* 136.

The specimens figured are all that have fallen under my notice, and are not sufficient to allow of precise definition. I found them in a hard black limestone, among the slaty rocks of Croyde Bay, on the south side of Baggy Point.

Locality.—As above; Baggy Point.

137. Spirifera mesomala, *pl.* 31, *fig.* 137.

Character.—Depressed, transversely elongated, radiated from the beak, with many small lateral, and a few broad *flat* mesial undulations.

It is this latter circumstance which attracted my attention. The mesial ridge of the upper valve of ordinary Spirifera is here a broad *flat* acute-edged fold, margined by two broad grooves, beyond which small radiating ribs cover the sides.

Locality.—In North Devon: Brushford.

138. Spirifera nuda, *pl.* 31, *fig.* 138.

Ref.—Spirifera nuda. *Sowerby*, in Geol. Trans., New Series, vol. v., *pl.* 57, *fig.* 8.

Character.—'Semicircular, with prominent beaks, smooth; the middle elevated, with a furrow on each side of it; edge obtuse.—*Locality*, Plymouth.'

The above account, given by Mr. Sowerby, applies accurately to several specimens which I have seen at Plymouth, and collected at Torquay. I have also found others in no respect different, except by having two, and even three furrows on each side of the mesial elevation. The general character which connects them all is the rounded extremity of the cardinal line, for which reason I had marked the species in M.S. by the name of *Sp. amblyptera.*

Var. α. Hardly a trace of lateral plaits—fig. 138 *b, c.*

β. With two or three obtuse lateral plaits—fig. 138 *a, d, e.*

Locality.—In South Devon: Plymouth; Hope, near Torquay.

139. SPIRIFERA ROTUNDATA, JUN., *pl.* 31, *fig.* 139.

Ref.—Spirifera rotundata. *Sowerby,* and Geol. of Yorkshire, vol. ii., *pl.* 9, *fig.* 17.

With some hesitation I refer some rather incomplete specimens in Mr. Lee's collection to *Sp. rotundata,* in a *young* state. I believe they have been generally esteemed to represent *Sp. pinguis* of Sowerby; but, by consulting Irish specimens, I find that is not the case.

Locality.—In South Devon: Barton.

140. SPIRIFERA MEGALOBA, *pl.* 31, *fig.* 140.

Character.—General figure rhomboidal (?) gibbous. Surface radiated with very few, *extremely broad,* tranversely imbricated ridges and hollows.

Having seen only the crushed specimen here represented, I am not able to present a more perfect description, but I presume it will be easily recognized.

Locality.—In North Devon: Brushford.

Genus. STRIGOCEPHALUS.

141. STRIGOCEPHALUS BURTINI, *pl.* 32, *fig.* 141.

Ref.—Terebratulites rostratus. *Schlottheim, pl.* 16, *fig.* 4.

Strigocephalus Burtini. *Defrance,* Dict. des Sciences Naturelles, *pl.* 75; *Bronn, tab.* 2, *fig.* 5.

Terebratula porrecta. *Sowerby,* Min. Conch., *tab.* 576.

Terebratula strigocephalus. *Von Buch,* Terebratula, p. 117.

Character.—Lesser valve sub-orbicular, larger valve extending beyond it, into an acute angled, curved beak; foramen on a broad area, which is flat, sharply bordered, striated across and lengthways. (With age the triangular foramen is partially contracted with shelly matter, and a round opening remains instead, and this finally closes.)—Bronn.

Locality.—In South Devon: Bradley.

In North Devon: Combe Martin, Hagginton.

142. STRIGOCEPHALUS GIGANTEUS, *pl.* 27, *fig.* 142.

Ref.—Strigocephalus giganteus. *Sowerby*, in Geol. Trans., 2nd Series, vol. v., *pl.* 86, *figs.* 10, 11.

Character.—'Sub-orbicular, convex, smooth, with a straight pointed beak; valves nearly equal; area beneath the beak a right-angled triangle, flat; foramen narrow.'—(Mr. Sowerby.)

The specimens figured from Mr. Austen's collection appear to answer this description; but few of those which occur at Plymouth are so symmetrical, or so nearly orbicular. On the contrary, even in the least crushed and distorted specimens, they are almost always elliptical and oblique, and wider than long. They often shew down the middle of the upper valve the remains of the single septum. Is it really distinct from *Strigocephalus Burtini?*

Locality.—In South Devon: Plymouth; Newton.

143. STRIGOCEPHALUS BREVIROSTRIS, *pl.* 32, *fig.* 143.

Character.—Shell tumid, sub-orbicular; lesser valve sub-orbicular, larger valve extending beyond it into a short incurved tumid beak, surmounting a sharp broad foramen, receiving the beak of the valve. Surface smooth.

The want of anything like carination on the dorsal valve, the incurved tumid beak, convex figure, and orbicular contour, seem to claim for this shell a distinct designation. That it belongs to the same genus as *Strigocephalus Burtini,* seems pretty certain from the internal structure.

Locality.—In South Devon: Newton.

Genus. TEREBRATULA. *Von Buch.*
Section 1. *Genus* ATRYPA. *Dalman.*
Part of *Genus* ATRYPA. *Sowerby.*

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144. TEREBRATULA (ATRYPA) ASPERA, *pl.* 33, *fig*, 144 *a, b, c, d.*

Syn. and Ref.—Terebratula aspera. *Schlottheim,* Nachtrage, *tab.* 18, *fig.* 3.
Atrypa aspera. *Dalman, tab.* 4, *fig.* 3.
Atrypa squamosa. *Sowerby,* Geol. Trans., 2nd Series, vol. v., *pl.* 57, *fig.* 1.

Character. — Generally wider than long, lenticular, with slightly prominent incurved beak, minutely perforated below; front raised in a gentle curve. Surface radiated with from 12 to 20 broad rounded ribs, crossed by projecting concentric fringed laminæ of growth.

The distinctness of this species from *T. prisca,* when specimens of equal size are compared, is so great and obvious, that it is certainly necessary to preserve for it an applicable name. It appears doubtful whether this be the same thing as the supposed young of *T. prisca,* referred to by Von Buch. It is not identical with any form of the Atrypa called *A. aspera,* in Silurian Researches, nor with any shell yet found in mountain limestone. It occurs in the old strata on the Rhine, &c. exactly as in Devonshire, where it may be compared with *Atrypa prisca.*

Locality.—In South Devon: Newton; Hope, near Torquay.

145. TEREBRATULA (ATRYPA) PRISCA, *pl.* 33, *fig.* 145.

Ref.—Terebratulites priscus. *Schlottheim,* Petref., *tab.* 17, *fig.* 2.
Terebratula affinis. *Sowerby,* in Min. Conch., *tab.* 324, *fig.* 2.
Terebratula prisca. *Von Buch,* Terebratula, p. 71.
Atrypa affinis. *Sowerby,* in Sil. Researches, *tab.* 6, *fig.* 5.
Atrypa reticularis. *Dalman, tab.* 4, *fig.* 2.
Terebratula reticularis. *Bronn,* Leth. Geog., *tab.* 2, *fig.* 10 *a, b, d.*

Character.—Generally oblong, without angles, the beak of the lower valve very little prominent, incurved, and pressed to the beak of the upper valve; front margin a little advanced, and generally, in old specimens, a little undulated; upper valve most convex. Surface radiated with many elevated round striæ, the number continually augmented toward the margin, and crossed by (often distinct) imbricating striæ, so as to give a reticulated aspect.

Most of the specimens of this species which have fallen under my observation are of the *very large* variety figured in Schlottheim, tab. 17, fig. 2. Similar specimens have been shewn me by Mr. Griffith, from the south-west of Ireland, County Kerry. Very rarely I have seen as large specimens in the Aymestry limestone, near Ludlow. Specimens of the usual size and aspect also occur at Hope, near Torquay.

Locality.—In South Devon: Plymouth; Barton.

146. TEREBRATULA (ATRYPA) DESQUAMATA, *pl.* 33, *fig.* 146.

Ref.—Atrypa desquamata. *Sowerby*, Geol. Trans., 2nd Series, vol. v., *pl.* 56, *figs.* 19-22.

Character.—Sub-orbicular, regularly convex, the upper valve most so, the lateral margins more or less reflected toward the lower valve, and the front more or less elevated toward the upper valve. Surface striated from the beaks, the striæ divaricating, or receiving intermediate ones of about the same size toward the margins. Beak of the lower valve extended, with a small triangular area beneath it, pierced by a small round hole *near the hinge line,* and occasionally connected (in a young state) with a narrow slit. Hinge line between the beaks straight (young) or undulated by the forward projection of the upper valve (old). Internal surface striated, or punctated, a large oval bordered space for muscular attachment under the beak of the lower valve, teeth in both valves at the hinge nearly as in ordinary Terebratulæ of the plaited division. The analogy of this beautiful fossil to *Atrypa prisca* is considerable, but the species are totally distinct. I have not seen it from any other district than Devonshire and Cornwall. By making casts of the interior, I have satisfied myself that the species occurs at Petherwin, and is recognizable as a cast.

Locality.—In South Devon: Newton; Plymouth.

In Cornwall: South Petherwin.

147. TEREBRATULA (ATRYPA) INSPERATA, *pl.* 33, *fig.* 17.

Character.—Oblong oval, with a prominent incurved beak. Surface radiated, and concentrically striated, radii commonly bifurcated, most prominent on the mesial part of the shell.

The only mountain limestone fossil with which I am acquainted resembling this, is *Spirifera duplicicosta*, pl. 10, fig. 1, of the Geology of Yorkshire, vol. ii. It is longer than that, and appears to shew no cardinal area. As far as can be seen in this impression of the upper valve and beak of the lower, the beak is nearly or quite imperforate. It offers perhaps a greater resemblance to the large *Atrypa desquamata* of South Devon, but upon the whole I suppose it to be a new species.

Locality.—Coddon Hill, in white shale. I found it on the south side of the hill, the only fossil which the small excavation by the road-side yielded me.

148. TEREBRATULA (ATRYPA) CASSIDEA, *pl.* 34, *fig.* 148 *a*, *b*, *c*.

Ref.—Atrypa cassidea. *Dalman*, *pl.* 5, *fig.* 5.

The general figure of this species (drawn of the natural size) is so very like that of the small *Terebratula navicula* (Murchison's Sil. Researches, pl. 5, fig. 17), that it is difficult to believe they belong to different sections of Terebratulæ, though I believe them to be distinct specifically. The only specimens I have seen (from Newton) suggest, however, a comparison with *Atrypa cassidea*, and though the imperfection of the Devonshire specimens does not permit a complete determination, yet the agreement in general figure and proportions, with the probable accordance of surface, is enough to justify the reference.

Locality.—In South Devon: Newton.

Family. CYCLOTHYRIDÆ.

Genus. TEREBRATULA—of most authors.

Syn.—Atrypa. *Sowerby*.

Mr. Sowerby has included such of these as fell under his notice (with others not observed by me) in his large group of Atrypæ. The perforation is seldom to be clearly seen, so as to allow of our being sure that it is separated from the hinge line, which is required to justify the reference of them to the true Terebratulæ. Guided, however, by their obvious analogy to ordinary forms in the lias and oolites, I shall omit for these the parenthetical term Atrypa.

149. TEREBRATULA PROBOSCIDALIS, *pl.* 34, *fig.* *a*, *b*.

Character.—Elongate, with a prominent beak, and broad advanced front margin; uniformly convex in the middle of the valves; surface marked with many equal striæ, conspicuous only near the edge.

Locality.—I found the specimens of this pretty shell only in the limestone of Hope, near Torquay.

150. TEREBRATULA CUBOIDES, *pl.* 34, *fig.* 150.

Ref.—Atrypa cuboides. *Sowerby*, Geol. Trans., 2nd Series, vol. v., *pl.* 56, *fig.* 24.

Character.—Sub-globose, front margin extremely elevated in a large sinus, with nearly parallel sides. Excepting the process which fills this sinus, the lower valve is nearly flat, and has a small beak. Striæ numerous, not sharp, reaching to the beaks; about fifteen of them are on the elevated mesial sinus.

This might easily be mistaken for *Terebratula Wilsoni;* the edge however is sharp.

Mr. Sowerby's specimens appear to have had a more square-formed sinus than in those which I have found.

Locality.—In South Devon: Plymouth; Hope, near Torquay.

151. TEREBRATULA BIFERA, *pl.* 34, *fig.* 151.

Character.—Tetrahedral (four of the angles rounded, two of the sides nearly straight, and two concave), beak acute; upper valve trilobate, the middle lobe longest, and elevated toward the front. Surface radiated with fine equal striæ, which bifurcate at various distances from the beaks, particularly toward the margins, so as there to be 50 or 60 in number.

This is very like in general figure to the species which Mr. Sowerby calls *T. latissima;* but so many specimens, all agreeing in the peculiar striation mentioned above, fell under my notice while exploring the rocks of Hope, near Torquay, that I cannot hesitate to reckon it as of a new and distinct type.

Locality.—In South Devon: Hope, near Torquay.

152. TEREBRATULA CRENULATA, *pl.* 34, *fig.* 152.

Ref.—Atrypa crenulata. *Sowerby*, in Geol. Trans., 2nd Series, vol. v., *pl.* 56, *fig.* 17; and *Murchison* and *Sedgwick* (Table of Fossils), same vol., p. 704.

Character.—'Pentagonal, compressed [depressed], smooth; front broadly and suddenly elevated, crenulated by numerous small plaits near its margin; sides smooth; beak scarcely any. A neat species.'—(From Mr. Sowerby.)

It is one of the prettiest fossils in the limestone of Barton, near Torquay. Mr. Sowerby gives no locality, but in Murchison and Sedgwick's table, it is assigned to Plymouth. Comparing this with *Terebratula bifera*, the difference in the form and character of plaits will suffice for distinction. If we put together a variety of specimens of *T. crenulata*, *T. cuboides*, *T. flexistria*, and *T. bifera*, the difficulty of classifying the Terebratulæ of Devon will easily appear.

Locality.—In South Devon: Barton.

153. TEREBRATULA LATICOSTA, *pl.* 34, *fig.* 153.

Compare Terebratula amphitoma. *Von Buch*, Terebratula, *pl.* 3, *fig.* 45.

Character.—Transversely extended to a wide elliptical figure, with mesial sinus in front, and very slightly projecting obtuse angled small beak, in (or under) which the aperture is remarkably small. Ribs not above 20 in number, obtuse, nearly equal, prominent toward the obtuse borders, crossed by distinct lines of growth.

The general resemblance of the Devonshire fossils to Von Buch's figure and description, is so great, that I should have placed them in the same species without hesitation, but for the following differences:—

1. In specimens well preserved, and of the same size as Von Buch's figure, the upper valve is not depressed in the mesial portion.
2. The border of good specimens is generally subtruncate, blunt in front.
3. The ribs are broader and fewer. In specimens of the

same size as Von Buch's, are 16 to 20 ribs, but in Von Buch's 26 to 30.

Locality.—North Devon: Baggy Point, in limestone.

154. TEREBRATULA ANISODONTA, *pl.* 34, *fig.* 154.

Character.—Transversely elliptical, depressed, the front straight, the beak rather prominent. Front largely and angularly raised to a straight mesial edge, deeply indented by six intervening narrow rounded ridges; sides rather reflected towards the deep valve, and very deeply and broadly notched by short acute bold ridges.

On comparing the specimens thus described, with some of the numerous and apparently distinct varieties of *Terebratula pleurodon,* mentioned in my work on the Geology of Yorkshire, I find it difficult to doubt their close affinity. The variety which I have in that work called Polyodonta, is in this case. In that variety, however, all the plaits are acute, and they extend to the beak; here the mesial plaits are obtuse, and none of them reach the beak. Whether in younger specimens from Devonshire this distinction would appear, I am unable to say, but at present the only prudent course is to give at least a provisional name to every well-recognized and apparently distinct form. 'Nomina si pereunt, perit et cognitio rerum.'

Locality.—In South Devon: Barton.

155. TEREBRATULA PLEURODON (?), *pl.* 35, *fig.* 155.

Compare Tereb. pleurodon. *Phillips*, Geol. of Yorkshire, vol. ii., *pl.* 12, *figs.* 25, 26, 28.
Tereb. sulcirostris. Geol. of Yorkshire, vol. ii., *pl.* 12, *figs.* 31, 32.
Tereb. plicatella. *Dalman*, *tab.* 6, *fig.* 2.
Tereb. mantiæ. *Sowerby*, Min. Conch., *tab.* 277.

With respect to the Terebratulæ of North and South Devon and Cornwall, generally, it is to be observed that the injury from cleavage—structure, and decomposition of substance, which affects most shells in those districts, is such, in many of this genus, as to render it impossible to recognise species except by the most general analogies. If, in studying the cretaceous, or oolitic species of Terebratulæ, we experience uncommon, and as yet unsurmounted difficulties, it is not to be expected that the investigation of the similar groups in older strata should be easy, or in the first instance satisfactory. I am sure, from examining many specimens of the most common plaited Terebratulæ—*e. g.*, *T. dimidiata* of green sand, *T. inconstans* of Kimmeridge clay, *T. obsoleta* of oolite, *T. tetraedra* of lias, *T. pleurodon*, *T. pugnus*, *T. acuminata* of mountain limestone,—that of all these there are so many variations in general form and minute ornament, as to puzzle and confound the most acute eye and memory. I do not think it is otherwise in regard to other species or other strata.

Perhaps hereafter, by surveying a very large collection of specimens, something may be done like what I have attempted in regard to *Terebratula pleurodon*, and *T. reniformis* and others, in my volume on mountain limestone fossils. In general, the numerous varieties which I group under the name of *T. pleurodon*, common in North Devon, and at Petherwin, have sharper plaits than *T. sulcirostris*, and a more positive mesial elevation than *T. Mantiæ*, if the rather irregular shell which is figured by Sowerby is to be taken as a type. They resemble not a little some of the varieties or species analogous to *T. nucula* (Sowerby), and *T. lacunosa*, of Dalman, which lie in the Ludlow, Wenlock, and Caradoc rocks. In particular they are often like *T. plicatella*, of Dalman. They also resemble very much some specimens not unfrequent in the magnesian limestone of Durham. After seeing these things, can it be a matter of surprise that palæontologists sometimes leave the nomenclature of their specimens undecided?

Locality.—In North Devon: Pilton; Croyde; Baggy Point.

In Cornwall: South Petherwin.

156. TEREBRATULA PUGNUS, *pl.* 35, *fig.* 156 *a*, *b*, *c*, *d*, *e*.

Ref.—Terebratula pugnus. *Sowerby*, in Min. Conch., *tab.* 497. Atrypa pugnus. Geol. Trans., 2nd Series, vol. v., *pl.* 56, *figs.* 15 and 18.

I know not how to characterize a shell so variable as this species. The figures represent varieties somewhat different from those given by Mr. Sowerby in the Geol. Trans. above referred to.*

Locality.—In South Devon: Barton.

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* TEREBRATULA FLEXISTRIA (?).

Ref.—Tereb. flexistria. *Phillips*, in Geol. of Yorkshire, vol. ii., *pl.* 12, *figs.* 33, 34.

I have seen from Newton Bushel and Plymouth some specimens which appeared to resemble closely this species, but none have come under observation perfect enough to be figured, or even certainly identified.

Locality.—Newton Bushel; Plymouth.

157. TEREBRATULA RENIFORMIS, *pl.* 35, *fig.* 157.

Ref.—Terebratula reniformis. *Sowerby*, Min. Conch., *tab.* 496. *Phillips*, Geol. of Yorkshire, *pl.* 12, *figs.* 13, 14, 15.

In the absence of lateral plaits, and in the character of the wide mesial fold (plaited), some of the specimens of Terebratula, from Newton Bushel, appear to be undistinguishable from varieties of *T. reniformis* (Sowerby). The figure is made rather more complete than the specimens I have seen, but their characters are preserved.

Locality.—In South Devon: Newton.

158. TEREBRATULA RHOMBOIDEA, *pl.* 35, *fig.* 158.

Ref.—Terebratula rhomboidea. *Phillips*, Geol. of Yorkshire, vol. ii., *pl.* 12, *figs.* 18-20.

Character.—Sub-pentagonal, rather depressed, with a minutely perforated small beak; front elevated with a divided plait, sides not plaited.

There appears no important difference between the Devonian and Yorkshire fossils.

Locality.—In South Devon: Barton.

159. TEREBRATULA ACUMINATA, *pl.* 35, *fig.* 159.

Ref.—Terebratula acuminata. *Sowerby*, Min. Conch., *tab.* 324. *Phillips*, Geol. of Yorkshire, vol. ii., *pl.* 12, *figs.* 4-9.

I have seen only very imperfect specimens of what are supposed to represent, in Devonshire, this common and variable species of the mountain limestone of the North of England.

Locality.—In South Devon: Newton Bushel.

160. TEREBRATULA AMBLYGONA, *pl.* 35, *fig.* 160.

Character.—Oblong pentahedral, slightly convex, with the front slightly elevated; surface radiated with a few broad ribs, which are transversely striated. The mesial furrow on the deep valve contains two broad ribs rather shorter than two others which bound the gentle depression.

I have seen no published drawing of this species, which is probably rare, and have only met with few examples in South Devon.

Locality.—In South Devon: Barton; Babbacombe.

161. Terebratula comta, *pl.* 35, *fig.* 161.

Character.—Oblong pentahedral, convex, with the front elevated (sometimes rather suddenly); surface radiated. In old specimens the radii increase in number, and are only conspicuous toward the crenulated margin.

Several specimens of this pretty shell have been examined, and I believe it to be distinct from any published species.

Locality.—In South Devon: Barton.

162. Terebratula angularis, *pl.* 35, *fig.* 162.

Compare T. primipilaris. *Von Buch,* Terebratula, *tab.* 2, *fig.* 29.
Atrypa primipilaris. *Sowerby,* Geol. Trans., 2nd Series, vol. v., p. 68, *pl.* 57, *figs.* 5, 6.

Character.—Pentagonal, beak angle obtuse; upper valve flattened in all the region near the beak; lower valve excavated into a broad and deep groove, reaching nearly to the beak, and raised against the upper valve. Opening in the beak minute. Surface radiated, the ribs being unequally and irregularly divided toward the edge, and two, more prominent than the rest, bounding the mesial furrow of the lower valve.

With Mr. Sowerby's figure ours from an imperfect specimen agrees, except in having fewer radiations. Von Buch's figure is still more covered by finer radiations, and I hesitate to believe that it is identical with the Devon shell. M. De Verneuil assures me that the species are different.

Locality.—In South Devon: Barton.

163. Terebratula ferita, *pl.* 35, *fig.* 163.

Ref.—Terebratula ferita. *Von Buch,* Terebratula, *tab.* 2, *fig.* 37 *a, b, c.*

Character.—Sub-triangular, the beak being the apex; and the lateral angles truncate (some specimens thus become pentagonal), depressed. Surface radiated, with a few very large ribs and furrows, curved on the sides and transversely striated. Hinge line very short and straight; space under the beak of the lower valve, flat.

By comparison with specimens from the Eifel, I find there is no doubt of the identity of my specimens with what are considered to be examples of *T. ferita* (Von Buch). The beak is in the Devonshire specimens usually more pointed than in Von Buch's figure. Compare also *T. cuneata,* Dalman, tab. 6, fig. 3.

Locality.—In South Devon: Barton.

164. Terebratula subdentata, *pl.* 35, *fig.* 164.

Ref.—Atrypa subdentata. *Sowerby,* in Geol. Trans., 2nd Series, vol. v., *pl.* 54, *fig.* 7.

Terebratula rotunda. *Munster,* Beitrage, *pl.* 14, *fig.* 15.

Character.—Depressed, pentagonal or sub-orbicular, rather oblong; sides rounded, beak small but rather prominent; front elevated with three short broad rounded plaits, and in old specimens remarkably produced.

Mr. Sowerby's figure represents a smaller specimen, but I am not at all in doubt as to the identity of the species, allowance being made for age. It seems to be uncommon, and is not mentioned from any other locality than that indicated below.

Locality.—In Cornwall: South Petherwin.

165. Terebratula juvenis, *pl.* 35, *fig.* 165.

Ref.—Atrypa juvenis. *Sowerby,* Geol. Trans., 2nd Series, vol. v., *pl.* 56, *fig.* 8.

Character.—Broad ovate, depressed, smooth; contracted toward the front; lower valve remarkably incurved at the minute laterally angulated beak. In full-grown specimens the side margins are undulated, and the front is rather depressed in the middle (fig. *b, c*).

Mr. Sowerby's figure represents a young specimen; mine is perhaps that of a full-grown individual. It is a well-characterized species, though I have specimens, supposed to be varieties of *Tereb. hastata,* from the mountain limestone of Yorkshire, whose only distinction is, that the widest part of the shell is nearer the front, while in the Devonshire forms it is nearer the beaks.

Locality.—In South Devon: Barton.

166. TEREBRATULA SACCULUS (?), *pl.* 35, *fig.* 166.

Ref.—Terebratula sacculus. *Sowerby*, Min. Conch., *tab.* 446.
Phillips, Geol. of Yorkshire, *pl.* 12, *fig.* 2.

Character.—Oblong, with a straight or emarginate front, which is sometimes elevated, and almost always defined by two broad obtuse ridges proceeding a short distance on the shell, on each side of a mesial broad shallow groove. Beaks prominent, incurved.

The specimen figured appears by its more prominent beak, less convexity, and want of elevation of margin, to differ from *Terebr. lachryma*, of Sowerby, more than by comparison of many specimens I find it to differ from small examples of *T. sacculus*, of the mountain limestone.

However, as it much resembles *Atrypa lachryma* (Sowerby, in Geol. Trans., 2nd Series, vol. v., pl. 56, fig. 9), I annex the description of that species as given by that author:—

Character.—'Sub-globose, smooth, oblong; front straight or slightly waved, scarcely raised except at the edge, which is deeply sinuated by the projection of the inferior valve, the central furrow of which is broad, flat, and bounded by two sharpish ridges. Beak not prominent.'

Locality.—In South Devon: Barton.

167. TEREBRATULA VIRGO, *pl.* 35, *fig.* 167.

Character.—Ovato-lanceolate, uniformly convex; with a prominent beak, and contracted nearly straight front margin, surface beautifully reticulated and marked by a few faint longitudinal striæ.

On comparison with some varieties of *Terebratula hastata,* I find much resemblance, but apparently this is distinct, by its prominent scarcely incurved beak, which has no lateral angulation on it.

Locality.—In South Devon: Barton.

168. TEREBRATULA HASTATA (?), *pl.* 35, *fig.* 168.

Ref.—Terebratula hastata. *Sowerby*, in Min. Conch., *tab.* 446.
Phillips, Geol. of Yorkshire, vol. ii., *pl.* 12, *fig.* 1.
Terebratulites elongatus. *Schlottheim*, Petref., *pl.* 20, *fig.* 2.

Though without many specimens it is not possible to determine the true specific relations of Terebratulæ, the resemblance of the Devonshire fossils to young specimens of the mountain limestone is sufficient to justify the calling of attention to the analogy, for the purpose of determining the matter more exactly, especially as I see traces of the lateral angulation of beak common on mountain limestone specimens. Somewhat of the hinge structure appears in 168 *b*.

Locality.—In South Devon: Newton.

The effect of introducing the classification of Brachiopoda presented on pp. 54, 55, would be a modification of Spirifera and Terebratula by transferring a part of the species here included in those groups to Cleiothyris and Hypothyris. Until, however, the foramen of the larger valve is more carefully examined, in the plaited species analogous to *Terebratula pleurodon, T. pugnus,* &c., in the smooth species allied to *Terebratula concentrica* (Von Buch), and *Spirifera imbricata* (Sowerby), and in those which rank with *Tereb. prisca,* it seems not desirable to disturb too much the existing methods of classification.

The series of Brachiopodæ here presented is continued in its general character to and into the magnesian limestone formation, with the omission, however, of Orthis and Strigocephalus.

GASTEROPODA.

In classifying the rather considerable number of species of this group already collected in Devonshire and Cornwall, we find the genera to require augmentation, and some of the species to demand a rather different allocation in the system than that usually assigned to them. These remarks apply to the so-called Buccina, Melaniæ, Terebræ, &c., for which provisional new genera at least must be constituted.

Proposed new Genus. ACROCULIA.

Etym.—*κυλιω*—to roll or incurve; *ακρον*—the apex.

There is little doubt that a new genus should be constituted for these fossils, which really offer but slight analogy to the recent group called Pileopsis, with which they have been provisionally placed.

Provisional Character.—Obliquely spiral, the apex free, the aperture ample, without columella, a sinus in the right lip.

169. ACROCULIA VETUSTA, *pl.* 36, *fig.* 169.

Ref.—Pileopsis vetusta. *Sowerby*, Min. Conch., *tab.* 607.

Phillips, Geol. of Yorkshire, vol. ii., *pl.* 14, *fig.* 19.

Character of the Devonshire specimens.—The figure of the shell is obliquely spiral; the incurved apex free, globose; a nearly round aperture emarginated on the inner and projecting on the outer part of the whorl; a few indistinctly marked spiral undulations.

The Devonian specimens appear to be so nearly identical with others from the mountain limestone series of Yorkshire, that I give to them the same name. Whether they be different from the species similarly named by Mr. Sowerby, in the Ludlow rocks, is to be determined by better specimens than I have yet seen.

Locality.—In South Devon: Newton.

170. ACROCULIA SIGMOIDALIS, *pl.* 36, *fig.* 170.

Character.—Obliquely spiral, apex incurved, adpressed; surface free from spiral undulations, but crossed by much bent striæ, reticulated on the outer part of the whorl.

I found one specimen only, at Hope, near Torquay.

Locality.—In South Devon: Hope.

Genus. EUOMPHALUS.

171. EUOMPHALUS CIRCULARIS, *pl.* 36, *fig.* 171.

Character.—General figure very depressed, conical; section of the whorls nearly round, but angulated toward the upper part; some traces of spiral crenulated striæ.

The general appearance is that of a Cirrus.

Locality.—In South Devon: Newton Bushel.

172. EUOMPHALUS SERPENS, *pl.* 36, *fig.* 172.

Character.—Discoidal, planorbo-spiral, smooth, lower side largely concave. Whorls, four or more, nearly round, or very slightly angular on the lower side.

Whether to call this Cirrus or Euomphalus, is hardly to be determined from the small specimens known; yet the species is probably recognizable.

Locality.—In North Devon: Brushford.

In Cornwall: South Petherwin.

In South Devon: Meadsfoot; Newton. These specimens are much larger than, and may be different from, the others.

Genus. NATICA.

173. NATICA MERIDIONALIS, *pl.* 36, *fig.* 173.

Character.—A small species, with no very distinct character, except the equidistant undulations, which are most prominent near the suture or the upper part of the whorl, and pass thence *directly longitudinal,* which is uncommon in this genus. Hence the name.

Locality.—In North Devon: Baggy Point.

174. NATICA NEXICOSTA, *pl.* 36, *fig.* 174.

Character.—Oval, spire of three tumid volutions, crossed by many equidistant small elevated ridges, of which a few are shorter, and sometimes united obliquely with the others.

The agreement of this shell with the species called *Natica lirata,* in the Geology of Yorkshire (pl. 14, fig. 22), is considerable; and as in that species two varieties are mentioned (with and without spiral striæ), so this may possibly be a third variety, having more numerous ribs, with a tendency to ramification. The three varieties might stand thus:—

Var. *α*: ribs rather distant; mountain limestone.

β: ribs rather distant, with spiral intercostal striæ; mountain limestone.

γ: ribs approximate; Cornwall, schist.

By comparing specimens, however, it appears most prudent to give a distinct name to the Cornish specimens.

Locality.—In Cornwall: South Petherwin.

Genus. TURBO.

175. TURBO TEXATUS, *pl.* 37, *fig.* 175.

Ref.—Turbo texatus. *Munster,* Beitrage, *tab.* 15, *fig.* 22.

Character.—General figure oblong, tapering to an acute apex; spire composed of five tumid volutions, without keel or band, but ornamented by many thin spiral threads, and cancellated by frequent longitudinal lines; aperture orbicular, umbilicus probably closed.

Probably an inhabitant of coral like *T. corallii* and *T. carinatus,* of the Ludlow rocks (Sil. Researches, pl. 5, figs. 27, 28.) The resemblance to *T. corallii* is rather close, but as Mr. Sowerby does not allude to any cancellation of the surface, it must be presumed to be distinct. I see no other difference between this and Count Munster's species, than in the more distinct character of the ornaments on the Devonshire specimen, (the best parts of the specimen, however, are here referred to.)

Locality.—In South Devon: Newton Bushel.

Genus. PLEUROTOMARIA.

176 *d.* PLEUROTOMARIA ANTITORQUATA, *pl.* 37, *fig.* 176 *d.*

Ref.—Schizostoma antitorquata. *Munster*, Beitrage, 1840, *pl.* 15, *fig.* 12.

Character.—General figure a spiral (sinistrorsal), tapering so that the axis is about equal to the diameter of the base. Volutions three or more, winding round a hollow umbilicus, tumid, with a concave smooth spiral (subsutural) band, parallel to which, both above and below, are many spiral threads, crossed and cancellated by other oblique threads, from the suture to the band, and from the band to the umbilicus. Thus regarding the intersections of the threads, the whole surface is moniliferous, or looking at the interstices, celluliferous. Cast smooth.

The beautiful fossil figured from the collection of Mr. Pattison, is sinistrorsal, like *Pleurot. acuta* (Phillips, Geol. of Yorkshire, pl. 15, fig, 21). I should have regarded this circumstance as unimportant, but from finding in Mr. Austen's specimens, and in the memoir above quoted, the same sinistrorsal figure, and precisely similar markings.

Locality.—In Cornwall: South Petherwin.
In South Devon: Newton.

176. PLEUROTOMARIA CANCELLATA, *pl.* 37, *fig.* 176.

Character.—Volutions very few, tumid; surface minutely and regularly reticulated, the crossings of the lines set with prominent puncta.

Locality.—In Cornwall: South Petherwin.
In North Devon: Brushford; Pilton.
In South Devon: Newton.

177. PLEUROTOMARIA ASPERA, *pl.* 37, *fig.* 177.

Ref.—Pleurotomaria aspera. *Sowerby*, in Geol. Trans., 2nd Series, vol. v., *pl.* 54. *fig.* 16.

Character.—Whorls angulated, with one distinct keel on the angle, the suture passing below it; above the angle, on the sloping surface, three or more spiral threads, the middle most prominent, cariniform; below the angle of the whorl a flat, broad, supra-sutural band, bearing two or three spiral threads, and below these on the base several spiral threads. The whole surface crossed by prominent longitudinal laminæ, which, on the spiral threads, rise to moniliform points, and produce transverse ridges on the carinated angle. Aperture nearly round.

In old shells the carinal band on the last whorl is more rounded and oblique. The general analogy between this beautiful species and *Pl. monilifera,* and *Pl. interstrialis* of the mountain limestone, is so great as to render it somewhat doubtful if these forms be really and essentially distinct.

Locality.—In North Devon: Pilton.

In Cornwall: South Petherwin.

In South Devon: Newton Bushel.

178. PLEUROTOMARIA MONILIFERA, *pl.* 37, *fig.* 178.

Ref.—Pleurotomaria monilifera. *Phillips,* in Geol. of Yorkshire, vol. ii., *pl.* 15, *fig.* 10 *a.*

Character.—Whorls bicarinate, spiral moniliform striæ.

The Devonshire fossil perfectly agrees in general figure with specimens of the above type which are of equal size, as, *e. g.*, the smaller figure on my plate above referred to. The upper carina is certainly more crenulated in these Devonian than in the Northern specimens, and upon the whole they offer analogy to *Trochus Bouei* of Steininger.

Locality.—In South Devon: Newton.

179. PLEUROTOMARIA EXPANSA, *pl.* 37, *fig.* 179.

Ref.—Pleurotomaria expansa. *Phillips,* Geol. of Yorkshire, *pl.* 15, *fig.* 4.

Character.—'Depressed conical, whorls few; band depressed, with arched retroflexed striæ; surface with oblique striæ and traces of spiral lines.'—(From Geology of Yorkshire.)

The agreement of the specimens I found at Baggy Point with the mountain limestone species is so great, that I have ventured to unite them. I can, however, see *no trace* of spiral striæ on the *upper part* of the whorls of the Devonshire fossils.

Locality.—In North Devon: Baggy Point, in limestone.

180. Pleurotomaria impendens, *pl.* 37, *figs.* 180 and 180*.

Ref.—Pleurotomaria impendens. *Sowerby*, in Geol. Trans., 2nd Series vol. v., *pl.* 57, *fig.* 16.

Character.—'Conical, short, spirally striated, base concave; whorls rather flat above, the lower overhung by the angular base of the preceding whorl; the striæ which encircle the whorls are less distinct towards the upper margin.'

The character is from Mr. Sowerby, who speaks of his specimens as imperfect. Mine are still more so, one being a section, the other a cast.

Locality.—In South Devon: Newton; Hope.

181. Pleurotomaria gracilis, *pl.* 37, *fig.* 181.

Character.—Very depressed; spire of about three internally rounded volutions, slightly banded, and smooth or very subtilely striated *across;* the striæ being on the lower side sigmoidal.

A small species. Had it shewn spiral striæ I should have referred it to *Pl. strialis* (Geol. of Yorkshire, vol. ii., pl. v., fig. 9). The band does not appear deep enough, nor sufficiently striated to be referred to *Schizostoma bistriata* (Munster, Petref., tab. 15, fig. 11).

Locality.—In North Devon: Brushford; Baggy Point.

New Genus. LOXONEMA.

Etym.—λοξος—oblique, and νημα—thread; in allusion to the oblique prominent thread-like striæ which cover the surface in all the typical species.

Character.—Spiral, turriculated; whorls convex, their upper edges adpressed against the next above; without spiral band; mouth oblong, attenuated above, effused below, with a sigmoidal edge to the right lip; no umbilicus (?) surface covered by longitudinal threads or ridges generally arched.

These observations are merely provisional until the form of the aperture is more perfectly known. The shells have been placed as Melania, Rissoa, Terebra, Turritella, and Scalaria.

In regard to the number of species mentioned, I must observe that I find it impossible to do otherwise than preserve the names of all, as distinct varieties; but that it is very probable most of them are only varieties of three or four types, one having *L. sinuosa* for one extremity, and *L. Hennahii* for the other; a second related to *L. tumida* and *L. lincta*; a third to *L. rugifera*. Count Munster's figures referred to, are certainly of Devonian species.

182. LOXONEMA SINUOSA, *pl.* 38, *fig.* 182.

Ref.—Terebra sinuosa. *Sowerby*, Sil. Researches, *pl.* 8, *fig.* 15.

Character.—Elongated, subulate, whorls numerous, convex, marked with fine sharp lines of growth sigmoidally arched, on all the whorls above the last they form a deep retral bend on the body of the whorl, and a deep forward bend at the suture.

The striæ are bolder on the Cornish shell, but in regard to their direction, they are similar to the figure in Mr. Murchison's work, and in some specimens they are finer than in others.

Locality.—In Cornwall: South Petherwin.

183. LOXONEMA NEXILIS, *pl.* 38, *fig.* 183.

Ref.—Terebra nexilis. *Sowerby*, (1840), Geol. Trans., 2nd Series, vol. v., *pl.* 54, *fig.* 17.

Melania arcuata. *Munster*, Beitrage, Petref. (1840), *pl.* 15, *fig.* 2.

Compare Melania sulculosa. *Phillips*, Geol. of Yorkshire, vol. iii., *pl.* 16, *fig.* 1 *a*.

Character.—Elongated, volutions convex, with longitudinal arched furrows, and intervening raised threads, retiring from and advancing towards the sutural lines, but less so than in *L. sinuosa*.

Count Munster's figure is satisfactory evidence of the occurrence of this shell at Elbersreuth, and he justly remarks on its resemblance to *Terebra sinuosa*, and on the differences of striation which appear to distinguish the species.

It is very like the *larger* Yorkshire shell, which certainly belongs to the group, if not to this species.

Locality.—In Cornwall: South Petherwin.

In South Devon: Newton.

184. LOXONEMA HENNAHIANA, *pl.* 38, *fig.* 184.

Ref.—Terebra Hennahiana. *Sowerby*, in Geol. Trans., 2nd Series, vol. v., *pl.* 57, *fig.* 22.

Character.—'Subulate, longitudinally and very finely striated, whorls slightly convex, striæ gently bent twice. Diameter not much above one-quarter of the height, which is but three-eighths of an inch.'—(Mr. Sowerby.)

The figure is taken from Mr. Sowerby's plate, no specimen so proper for figuring having come under my notice.

Locality.—In South Devon: Plymouth.

185. Loxonema lincta, *pl.* 38, *fig.* 185 *a*, *b*.

Character.—Ovoideo-conical, volutions convex, or rather tumid, covered with many equal sharp very slightly arched longitudinal striæ. The last whorl is quite as long as all the rest of the spire.

The disproportion of the whorls (owing to the last including and concealing so much of the penultimate), gives this shell its most obvious character, and suggests the probability that *Buccinum imbricatum* of Sowerby, from Devon, and *Buccinum arculatum,* of Goldfuss, from the Eifel, should be referred to this same genus.

Locality.—In South Devon: Barton.

186. Loxonema tumida, *pl.* 38, *fig.* 186.

Ref.—Melania tumida. *Phillips,* Geol. of Yorkshire, vol. ii., *pl.* 16, *fig.* 2.

Character.—Turrited, volutions remarkably convex, with arched longitudinal striæ.

Var. α.—The striæ very fine. This is the character of the specimens found in the mountain limestone of the North of England.

β.—The striæ having the character of small furrows. This is the appearance of the Cornish specimens.

Locality.—In Cornwall: South Petherwin.

187. Loxonema (?) præterita, *pl.* 38, *fig.* 187 *a*, *b*, *c*.

The distinctness of this form from all the other Gasteropoda of Devonshire, is evident; but there are no means to characterize it properly. The specimen marked 187 *c*, was found at Hope, near Torquay, and it shews the mouth pretty well, nearly agreeing with the aperture of Loxonema, as far as that is known.

Locality.—In South Devon: Newton Bushel; Plymouth; Chudleigh.

188. Loxonema rugifera, *pl.* 38, *fig.* 188.

Ref.—Melania rugifera. *Phillips*, Geol. of Yorkshire, vol. ii., *pl.* 16, *fig.* 26.

Character.—Elongated to a fine point; whorls convex, inferiorly angular and adpressed at the suture; crossed by many rather oblique, slightly arched, very strong ribs, prominent inferiorly; mouth roundish.

The figure is enlarged. It offers no material difference from young specimens of the species above referred to in the mountain limestone.

Locality.—In North Devon: Brushford.

New Genus. Murchisonia.

Proposed (in MS.) by De Verneuil and D'Archiac, to include *Buccinum spinosum*, and *B. abbreviatum* of Sowerby, *Turritella bilineata* of Goldfuss, &c., this generic group will also include a variety of the Turritellæ of my work on mountain limestone fossils, which are there marked by the *spiral band*, bent striæ, and elongate figure. They are a sort of elongate Pleurotomariæ or Schizostomæ, and, like them, were notched on the middle of the right lip.

189. Murchisonia angulata, *pl.* 39, *fig.* 189.

Ref.—Rostellaria angulata. *Phillips*, Geol. of Yorkshire, *pl.* 16, *fig.* 16.

Character.—General figure fusiform; whorls rapidly diminishing in size, angular, the upper ones tricarinate. The upper keel runs along the angle, the second is immediately below, the lower or third is sutural. The two upper keels constitute together the characteristic mesial band of the genus.

The small upper figure shews the natural size of a specimen from Brushford, which is represented on a larger scale below.

Locality.—In North Devon: Brushford.

In Cornwall: South Petherwin.

190. MURCHISONIA GEMINATA, *pl.* 39, *fig.* 190.

Compare Schizostoma tricincta. *Munster*, Petref. (1840), *pl.* 15, *fig.* 87.

Character.—Turrited, elongated, volutions angulated on the middle and there bicarinate, and crenated on the upper edge. Spiral and oblique striæ.

In its approximate carinæ this resembles the last; but the general figure is different, owing to the greater number and less acutely spiral angle of the volutions. The crenulated surface is also different. It approaches so near to the species mentioned by Count Munster, that except by some trace of spiral lines, and a crenated upper border, I should admit them to be identical. The specimen is not well preserved, and if some allowance be also made for the minuteness of Count Munster's shell, the analogy of the two becomes evident. I confess I think they will be found identical.

Locality.—In South Devon: Newton Bushel.

191. MURCHISONIA BILINEATA (?), *pl.* 39, *fig.* 191.

Ref.—Turritella abbreviata. *Sowerby*, Min. Conch., *tab.* 565, *fig.* 2.

Character.—Turrited, elongated, with nearly straight sides; volutions many, each bearing above the suture three carinæ, and one or more below. The upper and lower of the three exposed carinæ are more or less regularly crenated rather than tubercled, the middle one is plain and divided by a groove; oblique striæ cross the interstices. It varies in regard to the degree of crenation or granulation on the sutural carinæ.

The specimen figured is more distinct in this respect than the original one represented by Sowerby. Perhaps it is the *Turritella bilineata* of Goldfuss, as Bronn suggests. The specific name adapted to Turritella, will probably be changed as unsuitable to this really long form, if the new genus be received.

Locality.—In South Devon: Bradley.

192. MURCHISONIA SPINOSA, *pl.* 39, *fig.* 192.

Ref.—Buccinum spinosum. *Sowerby*, Min. Conch., *tab.* 566, *fig.* 4. Geol. Trans., 2nd Series, vol. v., *pl.* 57, *figs.* 24 to 27 inclusive.

Character of a young specimen.—Conical, elongated; a sharp furrow with raised borders winds round the middle of the whorls making the band, a row of large blunt spines above it. A row of smaller spines surrounds the base. Oblique striæ on the whorls meeting at an angle in the line of the furrow.

Character of an old specimen.—Ovoideo-conical; the spiral furrow flatly bordered; the lower row of tubercles obscure or absent, striæ as before.

The aperture is nearly round, or oval. There appears to be no notch or real canal at the base.

Locality.—In South Devon : Bradley.

Provisional Genus. MACROCHEILUS.

(*Etym.* μακρος—long; and χειλος—lip.)

The employment of the generic title of Buccinum, for the shells which follow, has been generally objected to, and with reason. It is difficult to make a proper distribution of them without including the consideration of a greater number of forms than have been found in England. There seem to be three groups, thus classed:—

Buccinum breve, is one.

Buccinum acutum, another.

Buccinum imbricatum, Buccinum arculatum, and *Polyphemus fusiformis,* a third.

It is perhaps the safest plan to name provisionally a new genus for the classification of these groups, but I confess I think *B. arculatum, B. imbricatum,* &c., allied to Loxonema; *B. breve,* to Natica, and the others to be alone sufficiently peculiar to deserve a generic title. They are probably holostomatous, not excepting even what has been called *Murex harpula.*

193. MACROCHEILUS BREVIS, *pl.* 39, *fig.* 193.

Ref.—Buccinum breve. *Sowerby,* Min. Conch., *tab.* 566 *fig.* 3.

Character.—Ovoid; aperture oval, acutely attenuated above; the peristome complete, a little reflected at the base: upper edge of the two whorls margined above by a line of tubercles, and ornamented with other rows below, those beneath the sutural line (which they undulate) the largest.

This is ranked as a Buccinum by Mr. Sowerby, but its aperture seems rather to connect it with the holostomatous Gasteropoda. Whether it belongs to Murchisonia or not, the striation on such specimens as I have seen does not indicate; but as there is no band probably it must be arranged elsewhere. Is it not related to Natica?

Locality.—In South Devon: Bradley, near Newton Bushel.

194. MACROCHEILUS IMBRICATUS, *pl.* 39, *fig.* 194.

Ref.—Buccinum imbricatum. *Sowerby*, Min. Conch., *tab.* 566, *fig.* 2.
Phillips, Geol. of Yorkshire, vol. ii., *pl.* 16, *figs.* 9, 17, 20.

Character.—Ovato-lanceolate; volutions slightly convex, their upper edges blunt, produced and pressed against the spire; finely striated, striæ nearly direct; aperture ovate, elongated, exceeding half the length of the shell.

Var. α.—Extension of the mouth at the base of the columella slight.—(*See* the figure in Geol. of Yorkshire above quoted, and that in Geol. Trans., for comparison with fig. 194 *a*, on pl. 39.)

β.—Extension of the mouth considerable.—(*See* the figure in Min. Conchology, and fig. 194 *b*, on pl. 39.)

The last whorl considerably exceeds in length the whole of the spire. The two varieties mentioned above are almost certainly distinct shells. Perhaps what is marked as var. *α*, should be classed with Loxonema, and var. *β*, with the so-called *Buccinum acutum.*

Locality.—In South Devon: Bradley; Newton.

MACROCHEILUS ACUTUS.

Ref.—*Sowerby*, in Geol. Trans., 2nd Series, vol. v., *pl.* 57, *fig.* 23.

Not having met with a satisfactory specimen of the shell named and figured by Mr. Sowerby, in the Geol. Trans., I refer to his representation. Once I thought the var. *β*, represented pl. 39, fig. 194 *b*, might be the same shell as that above referred to. It is surely not identical with *Buccinum acutum,* Min. Conch., tab. 566, fig. 1 (an excellent figure), nor with the shells so called in the Geol. of Yorkshire, pl. 16.

Locality mentioned.—In South-Devon: 'Stonehouse-hill.'

195. MACROCHEILUS ELONGATUS, *pl.* 39, *fig.* 195.

Character.—Very elongate, fusiform, whorls apparently few, the last being about two-thirds of the whole length; volutions gently convex, mouth much extended at the base.

The proportions are so entirely different from those of *Buccinum acutum*, that it appears necessary to give it a distinctive name. I have however seen only one specimen, and that a cast.

Locality.—In South Devon: Newton.

196. MACROCHEILUS (?) NEGLECTUS, *pl.* 29, *fig.* 196.

Compare Turbo subangulatus. *Sowerby*, in Geol. Trans.,
2nd Series, vol. v., *pl.* 57, *fig.* 18.

Character.—'Conical, elongated, volutions about six, convex, marked with three obscure spiral ridges on each; aperture nearly circular.'—(From Mr. Sowerby.)

The specimen figured (natural size at 196 *a*, and enlarged in 196 *b*), is perhaps the same as the shell referred to, but it is the only one I have seen, and is too indistinct for the resemblance to be insisted on.

Locality.—In North Devon: Brushford.

197. MACROCHEILUS HARPULA, *pl.* 39, *fig.* 197.

Ref.—Murex harpula, Min. Conch., *tab.* 578, *fig.* 5.
Nerita subcostata. *Goldfuss*, quoted by *Bronn.*

Character.—General figure oval, acuminated toward the apex; volutions rather tumid, crossed by an interrupted or double series of small sharp oblique plaits; the upper ones most conspicuous, the lower ones more numerous; between them a narrow plain space; columella remarkably thickened at the base. Aperture nearly round, or rather elliptical, and angular above.

Mr. Sowerby has given (Geol. Trans., New Series, vol. v., pl. 57, fig. 21), a representation of the young, which is much different from the old one, and somewhat resembles *Natica meridionalis*, pl. 36, fig. 173. There appears some analogy between these shells and that named *Pleurotomaria lirata*, in Geol. of Yorkshire, vol. ii., pl. 15, fig. 13, but that has a distinct band.

Locality.—In South Devon: Bradley, Plymouth.

CEPHALOPODA MONOTHALAMACEA.

Genus BELLEROPHON.*

198. BELLEROPHON STRIATUS, *pl.* 40, *fig.* 198.

Ref.—Bellerophon striatus. *Bronn*, Leth. Geog., *tab.* 1, *fig.* 11, (excl. Synonyms).

Character.—Sub-globose, umbilicus moderate in the shell (large in the cast); keel narrow, elevated; surface marked with fine arched striæ, which meet the keel in a slight retral angle, aperture very transverse.

I find, on a careful comparison with specimens and figures, nothing so nearly agreeing on the whole with the Devonshire specimens as the figure of Bronn. The keel is not so *fine and thread-like* as in *B. tenuifascia* (as I have it from mountain limestone); the striæ meet the keel less acutely than in *B. costatus*; in *B. hiulcus* the band is flat and defined.

Locality.—At Yealm Bridge, near Launceston, is a different species.

In South Devon: Newton; Plymouth.

199. BELLEROPHON URII, *pl.* 40, *fig.* 199.

Ref.—Bellerophon Urii. *Fleming*, British Animals; *Phillips*, Geol. of Yorkshire, vol. ii., *pl.* 17, *figs.* 11, 12.

Character.—Globular, involute, aperture very expanded, axis solid (*i. e.*, no umbilicus), *no band*, many regular broad spiral furrows separated by intervening narrow (crenulated) ridges, and crossed by fine lines of growth retroflexed from the mouth. Interior of the shell quite smooth.

In the Devonian specimens we see clearly the retroflexed incremental lines, and some traces of crenulation on the ridges. These circumstances probably are less distinctly noticed or even lost in older specimens, but as I find traces of them in a full-grown individual from Otterburn, in Northumberland, I suppose there is no sufficient reason to constitute a new species.

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* By several authors the Bellerophontes are ranked with *Mollusca Heteropoda.*

Locality.—In North Devon: Pilton; Baggy Point (in limestone).

200. BELLEROPHON TRILOBATUS, *pl.* 40, *fig.* 200.

Ref.—Bellerophon trilobatus. *Sowerby*, in Murchison's Sil. Researches, *pl.* 3, *fig.* 16.

Character.—A three-lobed involute shell, the central lobe largest, the inner whorls partly visible in a large rounded umbilicus, aperture wider than long.

Var. α.—Aperture very much wider than long, the trilobate character very prominent.—(*B. trilobatus*, of Sowerby.)

β.—Aperture less wide than in var. α, the trilobate aspect equally distinct, the tapering of the spire less rapid; the inner whorls very boldly carinated.

γ.—Aperture less wide than in the var. α, the trilobate aspect less distinct.

These varieties may, perhaps, upon the evidence of more specimens, prove to deserve specific names. They are from different points of the district.

Locality.—Var. α occurs in North Devon, at Baggy Point, in limestone, and in other districts; at Felindre, in the lower part of the old red sandstone; and at Eastnor Park, in Caradoc sandstone, &c.

Var. β has been found only at Meadsfoot Sands, near Torquay.

Va . γ, at South Petherwin, in Cornwall.

201. BELLEROPHON WOODWARDII, *pl.* 40, *fig.* 201.

Ref.—Nautilus Woodwardii. *Sowerby*, Min. Conch., *tab.* 571.

Bellerophon Woodwardii. *Phillips*, Geol. of Yorkshire, vol. ii., *pl.* 17, *figs.* 1, 2, 3.

Character.—Lenticular, convolute, the inner whorls very slightly concealed; surface spirally striated (in young shells the striæ are beaded lines), a dorsal sulcus. Section of the outer whorls sub-rhomboidal, of the inner ones oval; aperture nearly oval.

The fossil which, as coming within the above description, I refer to *B. Woodwardii,* does not shew distinctly any part of the shell. But its general figure, dorsal sulcus, and transverse section, are so exactly like specimens from other districts, that I conclude the reference is correct.

Locality.—In South Devon: Newton.

Doubtful Species of BELLEROPHON.

At Newton Bushel, and Meadsfoot Sands, in South Devon; at Brushford, Marwood, &c., in North Devon; occur small specimens of the genus Bellerophon, to which it seems proper to call attention, though the state of information regarding them is not such as to determine their true relations to forms which have been described from other districts.

202. BELLEROPHON GLOBATUS (?), *pl.* 40, *fig.* 202.

Specimens of this occur at Marwood, Pilton, Brushford, and are so like *B. globatus,* of Sowerby (Silurian Researches, pl. 3, fig. 15, and pl. 4, fig. 50), that they may be united therewith, though the characters are not very clear for that species.

203. BELLEROPHON WENLOCKENSIS (?), *pl.* 40, *fig.* 203.

Another is found in the limestone of Newton Bushel, which by its semiannular opening, and partially disclosed umbilicus, may be compared with *Bellerophon apertus,* or *B. Wenlockensis, in a young state.* I give it provisionally the latter name.—(*See* Sil. Researches, pl. 13, fig. 21.)

CEPHALOPODA POLYTHALAMACEA.

The genera admitted in this great series of shells, more or less analogous to Nautilus, are

- Orthoceras;
- Cyrtoceras;
- Nautilus;
- Goniatites;
- Clymenia.

Of these, the least settled are Orthoceras and Nautilus; the former *often not straight but incurved* about the apex with submarginal siphon, approaches to the evolute Cyrtocerata; and the latter exhibiting (in mountain limestone) analogies to Cyrtoceras, Clymenia, and Goniatites. This so-called genus (Nautilus) should be divided, and had there been more species discovered in Devonshire, I should have ventured to present some general views of the subject.—(*See* the article 'Polythalamacea,' in the Penny Cyclopædia.)

204. ORTHOCERAS CINCTUM (?), *pl.* 41, *fig.* 204.

Ref.—Orthocera cincta. *Sowerby*, Min. Conch., *tab.* 588; *Phillips*, Geol. of Yorkshire, vol. ii., *pl.* 21, *fig.* 1.

Character.—General figure elongate; surface girt with fine *undulated* raised lines; section, a very short ellipse; septa nearly direct, distant ·27, ·28, ·35 diameter, deeply concave; siphuncle central, or very nearly so.

I have scarcely seen any traces of the shell, girt with undulated lines, in these specimens, yet from the proportions and arrangements of the septa I presume the reference may be correct. The section is rather too elliptical for exact accordance.—(There are specimens at Petherwin perfectly round in the section, with septa rather less distant.)

Locality.—In South Devon: Newton.

In Cornwall: South Petherwin (?).

205. ORTHOCERAS LATERALE, *pl.* 41, *fig.* 205.

Ref.—Orthoceras undulatum. *Sowerby*, Min. Conch., *tab.* 59. Orthoceras undulatum, and Orthoceras laterale. *Phillips*, Geol. of Yorkshire, vol. ii., *pl.* 21, *fig.* 8.

Character.—General figure elongate conical, but near the aperture somewhat fusiform; surface (?); section elliptical, with diameters as 10 to 12; septa oblique, waved, distant ·27 to ·35 diameter, rather shallow; siphuncle excentric (on, or nearly on, the conjugate axis).

Differs from *O. imbricatum* by its less approximate septa. In one of the Petherwin specimens the fusiform shape near the aperture (noticed by Mr. Sowerby), and the position of the siphuncle excentrically in the interspace between the conjugate and transverse axes, are remarkable. This latter circumstance is observed in some young specimens from Kildare and Queen's County. *Orthoceras undulatum* is the name given by foreign writers to a different and well-known species.

Locality.—In Cornwall: South Petherwin.

In South Devon: Newton Bushel.

206. ORTHOCERAS LUDENSE, *tab.* 42, *fig.* 206 *a*, *b*, *c*.

Ref.—Orthoceras Ludense. *Sowerby*, in Sil. Researches, *pl.* 9, *fig.* 1.

Character.—General figure elongated, tapering; surface (?); section elliptical, with diameters as 10 to 12; septa direct, distant near the aperture about ·21, and near the apex ·40 + diameter; siphuncle nearly central, expanded between the septa, as in Ormoceras of Mr. Stokes.

In general aspect, distance of septa, place of siphuncle and magnitude, it nearly approaches *O. giganteum*, but differs in the plainness of the surface of its siphuncle. In *O. giganteum* (as I find by my specimens from Dumfriesshire, and from Yorkshire), the interseptal surface of the siphuncle is finely plaited.

Mr. Sowerby has figured, in Murchison's Silurian Researches, pl. 5, fig. 29, an allied species from the lowest beds of the old red sandstone of Herefordshire, called *O. striatum* (and also *O. bullatum*), in which the siphuncle is equally plain, but appears more cylindrical.

Locality.—In North Devon: Marwood.

In Cornwall: South Petherwin.

207. ORTHOCERAS IMBRICATUM, *pl.* 41, *fig.* 207.

Ref.—Orthoceratites imbricatus. *Wahlenberg*, Hisinger, Petref. Suec., *tab.* 9, *fig.* 9.
Sowerby, Murchison's Sil. Researches, *tab.* 9, *fig.* 2.

Character.—General figure an elongated cone; surface (?); section elliptical, with diameters as 10 to 12; septa very approximate, oblique, and waved, distant only ·10 diameter; siphuncle a little excentrical on the conjugate axis.

The prominent character is in the oblique, waved, and *very approximate* septa.

Locality.—In North Devon: Marwood.

208. ORTHOCERAS IBEX, *pl.* 43, *fig.* 208.

Ref.—Orthoceras ibex. *Sowerby*, in Sil. Researches, *tab.* 5, *fig.* 30.

Character.—General figure very gradually tapering; surface annulated by oblique rounded ridges, distant ·28 diameter, and longitudinally striated; section oval, with diameters as 10 to 13; septa (?); siphuncle a little excentrical on the conjugate axis.

Mr. Sowerby's figure appears intended to mark longitudinal lines in the interannular spaces, but in his description he does not mention this character. Our specimens are so striated.

Locality.—In Cornwall: South Petherwin.

209. ORTHOCERAS LINEOLATUM, *pl.* 43, *fig.* 209 *b.*

Ref.—Orthoceras annulatum. *Phillips*, Geol. of Yorkshire, vol. ii., *pl.* 21, *figs.* 9, 10.

Character.—General figure gradually or irregularly tapering; surface annulated by oblique ridges, distant ·25 diameter, and ornamented by fine gently waved transverse striæ; section rather oval; septa (?); siphuncle a little excentric on the conjugate axis.

Much confusion having arisen from the various meanings attached to *O. annulatum*, and Mr. Sowerby having recently explained that by that term he understands the species named *O. undulatum* by Hisinger, it is expedient to adopt for this species a new name.

Locality.—In North Devon: Croyde Bay.

210. ORTHOCERAS TENTACULARE, *pl.* 43, *fig* 210.

Character.—General figure a slender elongated cone (some specimens arcuate near the apex); surface annulated by oblique prominent (granulated?) ridges, distant about ·25 diameter; section nearly circular; septa apparently distant as much as one or more than one diameter of the shell, most distant in young specimens; siphuncle (?).

For a considerable time I supposed the specimens classed under the above title to be new Tentaculites of Schlottheim, but careful scrutiny leaves me no doubt that the right place for them is here assigned. The specimens are however not satisfactory in regard to the siphuncle and septa.

Locality.—In North Devon: Baggy Point, in limestone; Brushford, in slaty rock.

In South Devon: Meadsfoot Sands, in laminated limestone.

211. ORTHOCERAS TUBICINELLA, *pl.* 43, *fig.* 211.

Ref.—Orthoceras tubicinella. *Sowerby*, Geol. Trans., 2nd Series, vol. v., *pl.* 57, *fig.* 29.

Orthoceratites calamitaceus. *Munster* (on the authority of *De Verneuil*).

Character.—General figure slowly tapering; surface ornamented with prominent transverse oblique rings, which are crossed by numerous thread-like ribs; section circular; septa (?); siphuncle (?).

'By its annular character it resembles the recent *Tubicinella Balænarum.*'—(Mr. Sowerby.)

With Mr. Sowerby's description given above my fossil agrees exactly. He adds that the ribs *have no intermediate ones.* I have seen examples which shewed none. My very good specimen shews, however, an intermediate parallel striation, as represented in the figure.

Locality.—In South Devon: Newton.

212. ORTHOCERAS STRIATULUM, *pl.* 43, *fig.* 212.

Ref.—Orthoceras striatulum. *Sowerby*, in Geol. Trans., 2nd Series, vol. v., *pl.* 54, *fig.* 20.

Character.—General figure rather rapidly tapering; surface annulated with prominent transverse rings, crossed by numerous fine threads, which alternate with still finer lines; annulations sharp, oblique, distant ·33 or ·5 diameter; section (?); septa rather more approximate than the annulations; siphuncle (?).

Distinguished by its figure and much finer striations from *O. tubicinella*.

Locality.—In Cornwall: South Petherwin.

213. ORTHOCERAS CYLINDRACEUM, *pl.* 43, *fig.* 213.

Ref.—Orthoceras cylindraceum. *Sowerby*, in Geol. Trans., 2nd Series, vol. v., *pl.* 52, *figs.* 6, 7.

Compare Orthoceratites regularis. *Munster*, Beitrage, *pl.* 17, *fig.* 4.

Character.—General figure remarkably elongated (not cylindrical), sometimes a little curved; surface smooth (concentrically lineolated in fig. 213 *c*); section circular; septa very distant, ·5, ·66, ·75 of the diameter, deeply concave; siphuncle quite central, not at all tumid between the septa, but continuously cylindrical, and rather large.

I feel some hesitation about including the fossil represented pl. 43, fig. 213 *c*, in this group, not having seen in it any septa.

Locality.—In North Devon: Venn; Swimbridge; Bickington; Baggy Point (213 *o*).

Genus. CYRTOCERAS.—*Goldfuss.*

If we take as the type of this genus the chambered shells which are regularly arched, at least near the apex, if not partially involute (the arching or involution being *plane*), with even or simply waved septa, and dorsal or subdorsal (small) siphuncle, it will be found that the following species certainly belong to it:—

C. quindecimale;
C. tredecimale;
C. fimbriatum;
C. ornatum.

If, further, we admit a positive *obliquity* of the septa, as insufficient to constitute more than a section of the genus, we may include the following additional forms:—

C. obliquatum;
C. nautiloideum;
C. nodosum;
C. rusticum.

There are also a few of nautiloidal and one of irregular form.

In the mountain limestone the obliquity of the septa in the straight Polythalamacea, with excentric siphuncle, is similar to what here occurs in the Cyrtocerata. There are also arcuate species, *O. Gesneri, O. dentaloideum, O. arcuatum,* &c., which belong probably to Cyrtoceras. Perhaps many of the so-called Orthocerata ought to be removed from the genus to others allied to Cyrtoceras, Gyroceras, &c.

214. CYRTOCERAS FIMBRIATUM, *pl.* 44, *fig.* 214.

Character.—General figure arched, tapering; surface ornamented with about fifteen longitudinal ridges, crossed by many equal undulated membranaceous elevations; section elliptical (nearly as in *C. quindecimale*); septa apparently coinciding with the membranaceous risings; siphuncle near the dorsal convex line.

Locality.—In South Devon: Newton Bushel.

215. CYRTOCERAS TREDECIMALE, *pl.* 44, *fig.* 215.

Character.—General figure arched, tapering; surface ornamented by thirteen bold longitudinal ridges, crossed by continuous waved lines, every fourth of which coincides with an annular ridge higher and most prominent on the dorsal face; section elliptical (the dorsal region rather flattened), with diameters as 70 : 100; septa (?); siphuncle near the dorsal or convex side of the arch.

The annular ridges, coinciding with each fourth annular line, are most prominent dorsally, and give the shell an articulated aspect. It occurs in the Eifel.

Locality.—In South Devon: Newton Bushel.

216. CYRTOCERAS QUINDECIMALE, *pl.* 44, *fig.* 216.

Character.—General figure arched, and regularly tapering; surface ornamented with fifteen longitudinal ridges and furrows, crossed by annular membranaceous ridges, of which each fourth is more prominent than the others; section elliptical, the shorter axis being in the plane of inflexion, with diameters as 67 : 100; septa gently concave; siphuncle small near the dorsal or convex line of the flexure.

Locality.—In South Devon: Newton Bushel.

217. CYRTOCERAS ORNATUM (?), *pl.* 45, *fig.* 217.

Syn.—*Goldfuss*—(name in collection at Bonn).

Character.—General figure incurved, and tapering; surface ornamented by many longitudinal ridges and furrows, crossed by numerous waved elevated striæ, and at distant intervals by large prominent rugged annulations; section (?); septa rather deeply concave; siphuncle near the dorsal line.

It is to M. De Verneuil that I owe this reference to Goldfuss's name. The drawing which he shewed me exhibits a character on the back, for which the specimens I have seen from Devon are not sufficient to allow of strict comparison. In my catalogue it was named *C. foliaceum.*

Locality.—In South Devon: Newton Bushel.

218. CYRTOCERAS OBLIQUATUM, *pl.* 45, *fig.* 218.

Character.—General figure arched (involute), and tapering; surface ornamented by about thirty equal longitudinal ridges and furrows, crossed by numerous annular prominent lines of growth, which crenulate the ridges; a few distant large transverse undulations on the dorsal surface; section elliptical, the shorter axis being in the plane of involution; septa oblique, each alternate one corresponding to a transverse dorsal wave; siphuncle subdorsal, or half-way from the centre toward the convex line of the back.

Locality.—In South Devon: Newton Bushel.

219. CYRTOCERAS MARGINALE, *pl.* 46, *fig.* 219 *a*, *b*.

This name is assigned provisionally, to distinguish what appears to be a distinct species, though only one chamber is distinctly known. This chamber shews the following characters:—

The section was nearly round, rather flattened on the inner side of the arched shell; the septa are direct, distant ·14 diameter; the siphuncle marginal, not round, but a little pointed toward the dorsal line.

The species of so-called Orthoceratites in the carboniferous limestone, to which I have given the name of *Orthoceras arcuatum*, appears to resemble this rather closely.

Locality.—In South Devon: Newton Bushel.

220. CYRTOCERAS NAUTILOIDEUM, *pl.* 46, *fig.* 220.

Character.—General figure involute, tapering; surface (longitudinally striated?); section nearly circular; septa slightly oblique; siphuncle sub-dorsal, or half-way from the centre toward the convex line of the shell.

In general appearance very like to *Nautilus cyclostomus* (Phillips, Geol. of Yorkshire, vol. ii., pl. 22, fig. 6, and pl. 17, fig. 29). The coils of that species touch and press one another in a young state, and end in a straight prolongation.

Locality.—In South Devon: Newton Bushel.

221. CYRTOCERAS NODOSUM, *pl.* 46, *fig.* 221.

Ref.—Spirula nodosa. *Bronn*, Leth. Geog., *tab.* 1, *fig.* 4.

Character.—General figure arched and tapering (involute?); surface, dorsal face ornamented with bold, distant, transverse, semi-annular ridges; between them transverse striæ, crossed by faint longitudinal furrows; section elliptical, the shorter axis in the plane (?) of involution; siphuncle dorsal.

This species resembles *Cyrtoc. ornatum;* but by Bronn's figure the ornament of the surface is sufficiently distinct.

Locality.—In South Devon: Newton Bushel.

On the Lower Rhine, and in the Eifel, in limestone.

222. CYRTOCERAS RUSTICUM, *pl.* 46, *fig.* 222.

Ref.—Orthoceras arcuatum. *Steininger*, Mem. de la Soc. Geol. de France, *pl.* 22, *fig.* 6.

Character.—General figure arched, tapering gradually; surface tuberculated on the sides in a somewhat irregular manner, the tubercles being about half as numerous as the septa; section nearly round; septa somewhat unequal in thickness near the tubercles; siphuncle dorsal.

Locality.—In Cornwall: South Petherwin.

223. CYRTOCERAS (?) BDELLALITES, *pl.* 47, *fig.* 223.

Mr. Stutchbury has considered this group of Polythalamacea to deserve generic distinction. It presents often the appearance of incurvation, like the Hamites of Folkstone, and from some specimens Mr. Stutchbury has inferred that the septa were flexible.

From the analogy which may from this cause be fancied with the internal septa of a leech, he derived the name Bdellalites (βδελλα—a leech.) The specimens which I have examined from shale in Mudstone Bay (near Torquay), and limestone of Babbacombe, demonstrate the following characters:—

General figure unciform, or partially involute.—In some specimens involution appears at one end, and an irregular bending at the other, thus offering some analogy with Scaphites. Section elliptical, the shorter axis in the plane of incurvation; septa rather distant, concave toward the smaller or spiral end; in some cases the septal plate appears double; siphuncle sub-dorsal, generally swollen between the septa.

Both the internal septa and external shell were thin, so as to yield easily to pressure; in some specimens displacements appear; in others irregular bending and distortion, such as may naturally be expected in rocks so much disturbed by violent pressures and re-arrangements as those of North and South Devon.

224. CYRTOCERAS RETICULATUM, *pl.* 48, *fig.* 224.

Character.—General figure discoidally involute, with a flattened back; surface spirally furrowed and ridged, with flexuous transverse undulations on the sides, which are recurved, but less boldly marked across the back; parallel to these undulations are many close striæ, which are most conspicuous on the back, giving there a crenulated appearance to the spiral lines; section of the whorls, sides parallel, dorsal curve a flattened ellipse.

Locality.—In South Devon: Newton Bushel.

225. CYRTOCERAS ARMATUM, *pl.* 48, *fig.* 225.

Character.—General figure a rapidly tapering pyramidal shell, discoidally involute, the volutions separate, with a broad back; surface, each side marked by a row of large compressed tubercles; section elliptico-pentagonal, broadest on the back, the tubercular ridges projecting extremely; septa (?); siphuncle (?).

Analogous to *Nautilus tuberculatus* of Sowerby.—(Phillips, Geol. of Yorkshire, pl. 22, figs. 27, 29.) Its involutions are however fewer, and they do not touch; the last chamber is probably straight.

Locality.—In South Devon: Newton.

Genus. NAUTILUS.

226. NAUTILUS GERMANUS, *pl.* 48, *fig.* 226.

Compare Nautilus sulcatus, Min. Conch., *tab.* 571; Geol. of Yorkshire, *pl.* 17, *figs.* 18, 25; *pl.* 22, *fig.* 31; *pl.* 17, *fig.* 24; and *pl.* 22, *fig.* 34.

Character.—Discoidal, convoluted, the inner whorls exposed; spirally furrowed and ridged, the ridges and furrows crossed and crenulated by prominent lines of growth, which are retroflexed over the convex (spirally striated) back.

The exact relation of this fossil to several allied species in the carboniferous limestone, is perhaps still dubious. From *N. sulcatus* (Sowerby), *N. subsulcatus* (Phillips), and *N. quadratus* (Fleming), it appears to be distinguished by the very convex back; yet, as in some specimens from Coalbrook Dale the outer whorls of *N. sulcatus* are convex on the back, while in the same specimens the inner whorls are concave, this seemingly obvious distinction loses its value. A more constant difference is in the far greater depth and breadth of the latero-dorsal furrow of *N. sulcatus*, which occupies one-third of the whorl, while it is merely the largest of a series of small grooves in the Devonian specimens.

Locality.—In South Devon: Newton Bushel.

227. NAUTILUS MEGASIPHO, *pl.* 48, *fig.* 227.

This little sub-globose shell has no very marked character, except its extremely large siphuncle, placed a little excentrically toward the dorsal line. Its umbilicus is rather large.

Locality.—In Cornwall: South Petherwin.

Genus. GONIATITES.

In this remarkable and beautiful genus, already so rich in species, of which not one has yet been found above the coal formation, the character of the septa varies exceedingly. Allowance being made for the changes happening in an individual form, from the young to the old state (the septa being generally more simple in the young state), there is no character for species at all comparable to that which the configuration of the septa gives. In a few of those which follow it has not been possible to discover this essential point of structure. The species which occur at Petherwin resemble in general those described by Count Munster from the Fichtelgebirge, and those from Swimbridge, Bampton, Westleigh, and the vicinity of Exeter, all approach to, or are identical with, examples from the mountain limestone.

Count Munster's memoir on the Goniatites of the Fichtelgebirge, is quoted as translated in the *Ann. des Sciences Naturelles,* 1834.

228. GONIATITES INSIGNIS, *pl.* 49, *fig.* 228.

Character.—General figure very flat discoidal, involute, the whorls all apparent; surface of the inner whorls even, and obliquely striated across; of the outer whorl strongly marked by (oblique) radiating costæ (alternately longer and shorter), ending in bold rather acute tubercles on the outer edge; of the intermediate whorls slightly undulated, and marked by a few distant depressed tubercles; section of a whorl rather oblong quadrate, with rounded angles and an internal emargination; septa of an unusual form—*viz.*, with three very unequal lateral forward and as many retral inflexions, and one not deep dorsal retroflexion: there is some appearance of crenulation about these sutures: one septum to two radial ridges. Siphuncle very distinctly dorsal, and rather larger than usual in Goniatites.

This certainly much resembles *G. binodosus* of Munster, pl. 5, fig. 6, of which the suture is not figured; but is not, like that species, tubercular on the inner edge.

Locality.—In Cornwall: the eastern quarry at South Petherwin.

Munster's specimen of *G. binodosus* is from Schubelhammer.

229. GONIATITES LINEARIS, *pl.* 49, *fig.* 229.

Ref.—Goniatites linearis. *Munster, pl.* 5, *fig.* 1 *a, b, c.*

Compare Goniatites ovatus, *Munster, pl.* 4, *fig.* 3.

Character.—General figure globular involute, with a very minute umbilicus; surface (?); section of the whorls semicircular lunate, from their deeply embracing one another; septa with a very deep narrow dorsal, and acute lateral retroflexion.

The resemblance of the sutures of a full-grown shell to those of *Goniatites linearis* of Munster (*loc. cit.*, pl. 4, fig. 3 *a, b, c*), is so great that I cannot hesitate to refer these specimens to that species. But it is also true that a young individual gives a natural form and general figure very nearly, if not exactly resembling *G. ovatus* of Munster. The difference is principally in the angularity in the old, and obtuseness in the young, of the same lateral retroflexion.

Locality.—In Cornwall: South Petherwin.

230. GONIATITES BIFERUS, *pl.* 49, *fig.* 230.

Character.—General figure globular, involute, with a small umbilicus; surface covered with transverse flexuous striæ, retroflexed on the back; section (?); septa rather distant, with several rounded inflexions; the dorsal retroflexure very deep, placed between two advancing divided lobes, which meet the lateral inflexions at a rounded (runcimate) angle; siphuncle (?).

Locality.—In Cornwall: South Petherwin.

231. GONIATITES GLOBOSUS, *pl.* 50, *fig.* 231.

Ref.—Goniatites globosus. *Munster, pl.* 4, *fig.* 6.

Character.—General figure globular, involute, with a very well defined large umbilicus; surface (?); section of a volution like the half of an elliptical ring; septa (?); siphuncle (?).

Locality.—In South Devon: Newton Bushel.

232. Goniatites excavatus, *pl.* 50, *fig.* 232.

Character. — General figure discoidally involute, with an abruptly rounded back, and a large hemispherical regular umbilicus, disclosing the angular edges of many whorls; surface apparently smooth, but the edges of the whorls crenulated; septa (?).

I find no sufficient agreement between this and any published species. It is somewhat like *G. truncatus* of the mountain limestone, but has a larger umbilicus, and is still more like what an old specimen of *G. globosus* may be supposed to become.

Locality.—In South Devon: Newton.

233. Goniatites spiralis, *pl.* 50, *fig.* 233.

Character.—Involute (probably spheroidal) with a small umbilicus, spirally striated with minutely granulated lines, crossed by still finer and more minutely roughened lines of growth, and strengthened by gently curved *constrictions*. Internal structure indistinctly disclosed, but shewing sinuous septa near the centre. (Whorls probably few.)

I have seen this species in the mountain limestone of Yorkshire and Ireland, but not good specimens. Those from which I describe are compressed flat, but shew the dorsal aspect of the shell, the constrictions crossed by the fine spiral beaded threads, the chambered central part *uncompressed*, and the spiral character of the whole in a compressed mass. The spiral line round is added to assist the reader in picturing to himself this very beautiful fossil.

Locality.—In thin shaly beds connected with the black limestone of Bampton.

234. Goniatites crenistria, *pl.* 50, *fig.* 234.

Ref.—Goniatites crenistria. *Phillips*, Geol. of Yorkshire, vol. ii., *pl.* 19, *figs.* 7, 8, 9.

Character.—General figure sub-globose, umbilicus *very* small, rounded (in the cast much larger); surface ornamented with fine transverse, arcuate striæ, crossed by minute spiral lines which crenulate their edges; section of whorl lunulate or semicircular, the ends rounded; septa with one small narrow bifid dorsal and two lateral waves forward, the latero-dorsal wave very acute, the latero-marginal wave very obtuse.

As Mr. Sowerby describes a large angular umbilicus to his *G. carbonarius,* it is concluded to be distinct. But if the description were taken from a cast, it may still prove to be the same.

Locality—In North Devon: Swimbridge; Venn.

In South Devon: Trescot.

235. GONIATITES MIXOLOBUS, *pl.* 51, *fig.* 235.

Ref.—Goniatites mixolobus. *Phillips,* Geol. of Yorkshire, vol. ii., *pl.* 20, *figs.* 43-47.

Character.—General figure discoidally involute, depressed, the inner volutions partially concealed; surface (?); section (?); septa with elongated cycloidal (submucronate) lateral inflexions; the dorsal and first lateral retroflexions appear in some specimens undulated, or divided (as in *G. cyclolobus* and *G. mixolobus* of the Geology of Yorkshire, vol. ii.)

The analogy of these fossils to the two species just mentioned is very close: they also resemble, in a less degree, *G. Henslowi,* and *G. serpentinus,* all from the mountain limestone. The species which Mr. Sowerby calls *Gon. vinctus* appears to be different. It has not fallen under my observation.

Locality.—In North Devon: Westleigh, near Holcombe Regis; Bampton; Coddon Hill.

In South Devon: Lew Trenchard; Trescot.

We found at Combe, near Ashburton, and in a slate quarry near Beal's Bridge, abundance of impressions undistinguishable from those of Westleigh, &c., but it is impossible to say if they are of the same species or not, because no sutures are visible.

236. GONIATITES SPIRORBIS, *pl.* 51, *fig.* 236.

Ref.—Goniatites spirorbis. *Phillips,* Geol. of Yorkshire, vol. ii., *pl.* 20, *figs.* 1-5.

Character. — General figure discoidally involute, the inner whorls very slightly concealed; surface (?); section (?); septa with two very unequal *forward* lateral inflexions, and a very broad, slightly divided dorsal retroflexion; siphuncle (?).

Locality.—In North Devon: Westleigh, in thin shaly strata alternating with limestone beds. The specimens are not very satisfactory.

237. Goniatites serpentinus (?), *pl.* 51, *fig.* 237.

Ref.—Goniatites serpentinus. *Phillips*, Geol. of Yorkshire, vol. ii., *pl.* 20, *figs.* 48-50.

Character.—General figure planorbiform, discoidally involute, the inner whorls exposed; surface not distinctly traceable in this specimen; section of each whorl elliptical and slightly emarginate internally; septa with linguiform lateral inflexions; siphuncle (?).

It is not certain that the species here described is identical with that named *Goniat. serpentinus*, in the mountain limestone, because neither the surface nor the septa are sufficiently traceable. It is however of the same remarkable group.

Locality.—In South Devon: Newton Bushel (?)

238. Goniatites inconstans, *pl.* 51, *fig.* 238.

Character.—General figure, punctum or youngest shell subglobose; when very young discoidal and calyciform; specimens of middle growth shewing a large crenated umbilicus; with age the whorls acquire a narrowness toward the dorsal line, and a proportionate contraction of the umbilicus, thus rendering the aperture more oblong, and the whole figure lenticular; surface traversed by sigmoidally bent, sharp striæ, which on the back are deeply and broadly retroflexed, over a slightly cariniform band margined by two faint sulci, and on the inner edge collected by pairs or threes (or irregularly) into sharp short ridges, which enter the umbilicus. Spiral lines cross these striæ and decussate them most distinctly in young and middle-sized specimens. The cariniform character of the meso-dorsal region increases with the size, and the distinctness of the marginal ridges diminishes; section of a volution, when young, transversely lunulate, with age becoming hastate; septa (?); siphuncle (?)

A singular and beautiful shell, which passes through a series of forms parallel to those described in regard to *Goniatites reticulatus* in Geol. of Yorkshire, vol. ii., pl. 19, figs. 26-32. I at first believed it to be identical therewith, but the umbilicus is here larger, the ridges on the inner edge of the whorls are continued into the cavity, and the back is in all corresponding ages broader, and in the young state more cariniform in the middle.

Locality.—In South Devon: near Exeter, (Mr. Drury's cabinet.)

Genus. CLYMENIA. *Munster.*

This interesting group of Polythalamaceous shells was first instituted by Count Munster, under the name of Planulites. He subsequently changed that term (used previously in another sense) for Clymenia, which is too similar to Clymene, already employed by Savigny and Lamarck as a genus of Annulosa. Mr. Ansted, without knowing of Count Munster's previous labours, proposed the name of Endosiphosites, which is characteristic, (but not exclusively so, as there are Nautili with ventral as well as central and dorsal siphons); but by the consent of continental geologists, Count Munster's now well-known name is preserved. While investigating the fossils of the mountain limestone (1834 and following years), I sought among them in vain for a Clymenia. In March, 1838, Mr. De la Beche shewed me specimens from South Petherwin, which immediately delighted me with the first sight of a genuine example of the genus. At present I am acquainted with one instance of the occurrence of Clymenia in the British Isles out of the district under review, Mr. W. Gilbertson having lately shewn me a specimen from the mountain limestone of Ireland.

239. CLYMENIA LÆVIGATA, *pl.* 52, *fig.* 239.

Ref.—Clymenia lævigata. *Munster, tab.* 1, *fig.* 1.

Character.—General figure discoidally involute; the inner whorls very slightly concealed; surface transversely striated, the striæ retroflexed on the back; section of a volution elliptical, emarginate on the inner face; septa simply waved, bending forward on the back; siphuncle on the inner edge.

Locality.—In Cornwall: South Petherwin.

240. CLYMENIA STRIATA, *pl.* 53, *fig.* 240.

Ref.—Clymenia striata, *var.* costellata. *Munster*, in loc. cit., *pl.* 2, *fig.* 5.

Character.—General figure involute, with a large umbilicus; surface covered with sigmoidal striæ, which on the inner edge collect into ridges; septa very distant, bent angularly and in rounded curves, one wide rectangular forward bend on the back, one wide rounded forward bend on the sides, these meet in a pointed retral inflexion; siphuncle as usual. The shell is more convex than in Munster's figure.

Locality.—In Cornwall: South Petherwin.

241. CLYMENIA LINEARIS, *pl.* 53, *fig.* 241.

Ref.—Clymenia linearis. *Munster*, *tab.* 1, *fig.* 8.

Endosiphonites linearis. *Ansted*, Camb. Phil. Trans., vol. vi., *pl.* 8, *figs.* 1, 2, 3.

Character.—General figure discoid, convolute, the inner whorls mostly exposed; surface covered with gently bent striæ, crossing the back, which bears a keel or raised line; section of a volution elliptical, oblong, impressed by the inner whorl; septa not clearly seen; siphuncle small, in the usual place.

Locality.—In Cornwall: South Petherwin.

242. CLYMENIA FASCIATA, *pl.* 53, *fig.* 242.

Character.—General figure sub-globose, involute, umbilicate, the inner edges of the whorls obtuse, the back bearing a distinct flat band; surface striated across the whorls; section of a volution about three-quarters of an ellipse; septa with one broad simple forward wave; siphuncle a little removed from the inner edge.

Locality.—In Cornwall: South Petherwin.

243. CLYMENIA SAGITTALIS, *pl.* 54, *fig.* 243.

Character.—General figure rather depressed, involute, with a small distinct umbilicus, and a narrow back; surface (?); section of a volution lanceolate, with a deep internal emargination; septa contiguous, bent forward on the back, rather straight on the sides; siphuncle (?).

Locality.—In Cornwall: South Petherwin.

244. Clymenia plurisepta, *pl.* 54; *fig.* 244.

Character.—General figure discoidal, involute, with a large umbilicus; surface (?); section of a volution semi-elliptical, with straightish sides, emarginate internally; septa contiguous, gently undulated, with one rather wide forward wave on the back; siphuncle (?).

Locality.—In Cornwall: South Petherwin.

245. Clymenia valida, *pl.* 54, *fig.* 245.

Character.—General figure flat discoidal, involute, the inner whorls scarcely at all concealed; surface with short tumid radiating ribs on the inner half of the whorls, passing into about four times as many small ribs and furrows, which bend forward and undulate the back; section of a whorl oblong, elliptical; septa deeply waved, one forward dorsal undulation.

Locality.—In Cornwall: South Petherwin.

CRUSTACEA.

No example of any other group of Crustacea, than the family of Trilobites, has yet occurred in the older strata of the district under review.

TRILOBITES.

Of this interesting and characteristic family of Crustacea, North Devon yields two species; South Devon six or more; and Cornwall one. They are strikingly analogous to species found chiefly in the Ludlow rocks of England and Wales, the mountain limestone and the rocks of the Rhine valley and the Eifel. They are chiefly of the genus Calymene, of Brongniart. There is at least one species of Asaphus; one of the genus Homalonotus, of König; and another of the singular Asaphoid group, called Olenus by Dalman, and Brontes by Goldfuss; one of Harpes, lately described by Goldfuss.

Locality.—In North Devon: at Brushford, Pilton, Croyde, and Saunton, *Calymene accipitrina;* at Brushford, *C. lævis.*

In Cornwall: at South Petherwin, *Calymene granulata.*

In South Devon: at Meadsfoot Bay, *Homalonotus.*
at Hope, 1. *Calymene granulata.*
2. *Asaphus granuliferus.*
3. Portions of *Harpes,* &c.
at Mudstone Bay, *C. lævis.*
at Torquay, *Brontes* (*flabellifer*).
at Barton, *Harpes macrocephalus.*
Calymene Sternbergii.

246. HARPES MACROCEPHALUS, *pl.* 55, *fig.* 246.

Ref.—Harpes macrocephalus. *Goldfuss,* Acta Acad. Cæs. Leop. Carol. Nat. Cur., vol. xix., *pl.* 33, *fig.* 2.

Only by comparison with the excellent figures of Goldfuss could this imperfect, and probably very rare specimen have been properly identified and named.

Compared with any of the Silurian species of Trinucleus, the middle lobe of the Cephalothorax is different in shape, being narrowed anteriorly, while the surface of the lateral lobes is very differently relieved. Even the punctation on the border is different in style, and deficient in regularity. There is a whimsical resemblance between the head of Harpes and that of the singular fish called Cephalaspis.

Locality.—In South Devon: Barton.

247. CALYMENE STERNBERGII, *pl.* 56, *fig.* 247.

Ref.—Calymene Sternbergii. *Munster*, Beitrage, *tab.* 5, *fig.* 5.

A prominent and obvious character of this species is (in the cast) the transversely sulcated mesial lobe of the head, the anterior furrows going quite across, while in the posterior part they meet crucially. The space around the eyes appears to be tubercled, but the head itself is probably smooth.

Locality.—In South Devon: Barton.

248. CALYMENE GRANULATA, *pl.* 56, *fig.* 248.

Ref.—Calymene granulata. *Munster*, Beitrage, *tab.* 5, *fig.* 3.
Sowerby, in Geol. Trans., vol. v., *pl.* 54, *figs.* 23, 24.

Character. — Whole surface minutely granular, the head covered with small round prominent puncta, not larger than the facets of the eyes (sometimes a row of distinct granules on each abdominal and post-abdominal rib). Mesial lobe of the head *very large*, orbiculari-deltoidal and tumid; eyes reticulated, very closely approaching to the mesial lobe; anterior margin of the head trilobed, the lateral lobes extending beyond the eyes to a broad obtuse-angled surface.

Shell extremely thin on all the dorsal aspect, yet apparently composed of a double tunic.

Similar to *C. tuberculata* of Murchison, Sil. Syst., pl. 14, fig. 4 (from Wenlock limestone); but the mesial lobe of the head of that species bears larger tubercles (and the lateral lobes none).

It is also very like *C. accipitrina*, pl. 56, fig. 249, but the largely tubercular mesial lobe of the head, and the comparative smoothness of the lateral lobes of the head, and the nearly semicircular front margin, constitute obvious differences. It agrees well with Munster's figure and description, but the anterior margin of the head is somewhat blunter than in his figure.

Locality.—In South Devon: Hope, near Torquay, in limestone.

In Cornwall: South Petherwin.

249. Calymene Latreillii, *pl.* 56, *fig.* 249.

Ref. to description.—*Steininger*, in Mem. Geol. Soc. of France, tom. i., part 2.

Sowerby, in Geol. Trans., vol. v., *pl.* 53, *figs.* 12-15.

Character.—Mesial lobe of the head very large and tumid, and covered, especially on the central part, with round prominent tubercles, twice as large as the facets of the large eyes, which are situated very near to the mesial lobe of the head; anterior border nearly semicircular, spreading far beyond and behind the eyes, into a broad beak-like undulated surface. Eyes with less than 50 facets. Post-abdomen wide, ending in a semicircular border.

The surface of the abdominal region appears minutely granulated. The general figure of the species is very like *C. macrophthalma* of Brongniart, but that has a smooth or nearly smooth head, and the eyes are less approximated to the mesial lobe. Still closer is its resemblance to *C. tuberculata* of Murchison, which however, to judge by the figure in Sil. Researches, pl. 14, fig. 4, is a smaller species. In the Eifel occur several cognate forms to which Steininger applies the names of *C. Brongniartii*, *C. Latreillii*, and *C. Schlottheimii*. He mentions two varieties of *C. Latreillii*, the first, with a sunken space round the eyes, appears to agree with our species, and is considered by Steininger as *C. latifrons* of Bronn.

Locality.—In North Devon: Saunton shore, in nodulse; Pilton, near Barnstaple; Brushford, near Dulverton.

In South Devon: Hope; Barton.

250. Calymene lævis, *pl.* 55, *fig.* 250.

Ref.—Calymene lævis. *Munster*, Beitrage, 1840, *pl.* 5, *fig.* 4.

Character.—Head trilobate, the central division being very much the largest, widest anteriorly, and separated by a deep straight groove from the tumid lateral lobes; eyes (?); sides of the body nearly parallel; abdomen and tail plates bearing about twenty ribs on each lobe; posterior extremity almost truncate.

Count Munster notices the occasional apparent want of eyes, so remarkable in the Devonian specimens, which shew, generally, the inner face of the shell, or a cast therein.

Locality.—In North Devon: Brushford.

In South Devon: Mudstone Bay; Durlstone; Knowle Quarry, near Newton Bushel.

251. Asaphus granuliferus, *pl.* 56, *fig.* 251.

Ref.—Asaphus granuliferus. *Phillips*, Geol. of Yorkshire, vol. ii., *pl.* 22, *fig.* 7.

Post-abdominal region only yet found in Devonshire.

Surface minutely granulated; limb not striated.

I did not collect this specimen, but obtained it from Mrs. Wyatt, of Torquay, who stated that it was obtained from Hope, north of Torquay. I found numerous traces of Trilobites at Hope, in the shattered limestone beds of the top of the rock. This is in solid limestone. It is undistinguishable from the specimens referred to in mountain limestone.

Locality.—In South Devon: Hope, near Torquay.

252. Asaphus, *pl.* 55, *fig.* 252.

Nothing of this fossil is known except the form of the lateral portion of the head, bearing a lunated (small) eye. The border is apparently divided, as in *Calymene Blumenbachii*, before the eye. The surface is almost smooth; generally speaking, it resembles a portion of *Asaphus longicaudatus*.

Locality.—In South Devon: Hope, near Torquay.

253. Homalonotus Knightii (?), *pl.* 57, *fig.* 253.

Homalonotus Herschelii (?).

Compare figures of H. Knightii. *Murchison*, Sil. Researches, *tab.* 7, *fig.* 1; and

H. Herschelii. *Murchison*, Sil. Researches, *tab.* 7 *bis*, *fig.* 2.

As only parts of the abdominal plates have been seen, it appears unnecessary to describe them minutely. One of the specimens (fig. *d*) shews elevated tubercles on the antero-mesial and antero-lateral ribs (of the post-abdominal portion?), in which it agrees with *H. Herschelii*, of Murchison, Sil. Researches.

The others (figs. *a, b, c*) appear to agree best with *H. Knightii* (Murchison).

Locality.—On the coast, at Meadsfoot Sands, near Torquay, in laminated sandstone (figs. *b, c, d, e*), and in shale (fig. *a*).

254. BRONTES FLABELLIFER, *pl.* 57, *fig.* 254.

Ref.—Brontes flabellifer. *Goldfuss*, Acad. Cæs. Leop. Nat. Cur., vol. xix., *pl.* 33, *fig.* 3.

Only the post-abdominal portion of this very curious fossil has yet been found in Devonshire, but a complete figure has recently been published by Goldfuss, in the Transactions of the Academy above quoted. The following is a description of the tail plate of a Devonshire specimen:—

General figure orbicular, the anterior edge defined by a curved line gradually uniting with the circular border; surface granulated, depressed round the antero-mesial lobe and the border; antero-mesial lobe (the continuation of the central abdominal lobe) tumid, twice as wide as long, rounded on the retral edge. From its sides 14 (or including the anterior edge 16) narrow furrows proceed in a radiating form, so as almost to reach the edge, and thus leave 15 broad flattish ribs, of which the central one is rather the widest. (The retral edge, according to Goldfuss, turns inwards and under, so as to lie very near to the outer shell, and shews concentric striæ.)

This is not the same species as one found in the Wenlock limestone, of which formerly I sent a drawing to Mr. Murchison, who has noticed it under the name of *Asaphus* (*Olenus*) *flabellifer*. To shew the difference, a figure and description of that species are appended.

Locality.—In South Devon: Newton.

255. BRONTES SIGNATUS, *pl.* 57, *fig.* 255.

There is no published figure to refer to. The species is mentioned by *Murchison*, in Sil. Researches, p. 654.

Character of the post-abdominal or tail plate.—General figure a circle, from which a segment is taken by a straight chord line

SUPPLEMENT
TO
THE DESCRIPTIONS OF FOSSILS.

SINCE drawing up the preceding descriptions, and arranging all the figures, to plate 57 inclusive, I have been able to make a few interesting additions by splitting and re-examining the specimens which I had collected, and by studying a further valuable supply from Mr. Austen's drawers. In consequence, it was resolved to add supplementary plates, so as to include in this volume all the species of fossils which had been sufficiently examined. On pl. 59 has been copied the drawing of a very interestings pecimen collected by Mr. De la Beche, which was formerly published in the Geol. Transactions. These additional species have been introduced by giving them the number which best fits their place in the catalogue, and a star has been added for distinction. On pl. 58, two figures are marked 112*; the upper one should have a double star; the lower one is already placed in the catalogue. Some other figures are added to illustrate more completely species already described, and in the explanation of the plates some additional notice has been added of these and other fossils, which have been more completely known to me by the inspection of additional specimens.

39*. PLATYCRINUS TUBERCULATUS (?), *pl.* 60, *fig.* 39*.

Ref.—*Miller*, Crinoïdea, p. 81. Geology of Yorkshire, *pl.* 3, *fig.* 17.

Between the figure as given on pl. 14, and that on pl. 60, fig. 39*, are interposed several forms, one of which, not distinctly granulated, has the interscapular plate and general appearance of *Platycrinus elongatus*, Geol. of Yorkshire, pl. 3, fig. 24. The specimen represented, pl. 60, fig. 39*, has the air of *Platycr. tuberculatus* (Miller), but its surface is perhaps only rough by the weathering of the stone; its scapular plates are longer, and its pelvis more conical. Probably it had no interscapular plate. It may be referred, provisionally, to *Platycr. tuberculatus,* as at least a nearly allied species.

39**. Platycrinus pentangularis (?), *pl.* 60, *fig.* 42*.

Ref.—*Miller*, Crinoïdea, p. 81, *fig.* $\frac{1}{A}$.

Character.—In general proportions, and thinness of the calcareous integument, this agrees with the species indicated above, but there is no apparent division of the pelvis, and the arm articulation is not clearly seen. I believe that it is really an elongate species, congeneric with *Platycrinus interscapularis.* But further specimens are wanted to decide whether its pelvis was divided. *Adelocrinus hystrix* was probably an allied form, but the plates of that were muricated, of this apparently smooth.

41*. Cyathocrinus geometricus, *pl.* 60, *fig.* 41*.

Ref.—Cyathocrinites geometricus. *Goldfuss,* Petref., *tab.* 58, *fig.* 5.

Character.—General figure globose, pelvic and costal plates raised conically in the middle, and radiated by sharp ridges in five or six sets, which cross the sutures, and unite with those of the adjoining plates. Columnar adherence minute.

Goldfuss figures a specimen which shews more completely than my figure the scapular articulation.

Locality.—In South Devon: Newton.

49*. Cyathocrinus distans, *pl.* 58, *fig.* 49*.

Provisionally named from the uncommon length (compared to the diameter) of the columnar joints. The surfaces are strongly radiated, and the canal is pentangular or pentaphylloidal.

Locality.—In North Devon: Coddon Hill.

49**. Sphæronites tessellatus, *pl.* 59, *fig.* 49**.

Ref.—*De la Beche,* in Geol. Trans., New Series, vol. iii., *pl.* 20.

In the explanation of the plate referred to is a note by Mr. Broderip, calling attention to some analogy between this fossil and *Chelyosoma macleayanum,* a species of tunicate mollusca, which has a few coriaceous plates on the upper surface only. Mr. Austen, who has examined the specimens in the collection of the Geological Society, and has communicated his observations to me, appears also to have considered this analogy, but I have little doubt that he rightly refers to the Echinodermata for the principal points of structural affinity. My own impression has hitherto been that the fossil is allied to Echinospherites of Wahlenberg (Sphæronites of Hisinger) and to Hemicosmites and Cryptocrinites of Von Buch, (Konigl. Akad. zu Berlin, 1840). It is of a more produced or balloon-shaped figure than *Sph. pomum*, and appears to end (Mr. Austen informs me) in a fine point. The numerous, nearly equal plates are prominent in the centre, striated parallel to the border, and not granulated. Mr. Austen has noticed some singularities in the internal structure of these plates, which, when completely studied, may throw great light on the general history and affinities of the fossil. Meantime I wish to include it in the group to which it bears the most obvious external resemblance, and therefore propose to name it, for provisional reference, *Sphæronites tessellatus*.

Locality.—In South Devon.

CONCHIFERA PLAGIMYONA.

53*. Sanguinolaria lirata, *pl.* 58, *fig.* 53* *a*, *b*.

Character.—Transversely extended to a width more than double the length; anteriorly rounded, posteriorly sub-truncate; evenly convex, but ridged on the posterior slope; surface smooth, with raised acute threads parallel to the margin, and strongest on the posterior parts of the shell.

Locality.—In North Devon: Pilton.

60*. Megalodon carinatum, *pl.* 60, *fig.* 60* *a*, *b*.

Ref.—*Goldfuss*, Petref., *tab.* 132, *fig.* 9.

Compare Cypricardia rhombea, Geol. of Yorkshire, *pl.* 5, *fig.* 10; and Cypricardia cymbæformis, Sil. Researches, *pl.* 5, *fig.* 6.

Character.—The obliquely elongate figure, anteriorly sublobate outline and convex diagonally carinated surface, easily mark this species. The beaks are recurved, over a small excavated lunula. The lines of growth are prominent; the keel elevated.

Locality.—In South Devon: Newton.

62*. MODIOLA SCALARIS, *pl.* 60, *fig.* 62*.

Character.—Depressed, transversely elongated to a parallelogrammic figure, with elliptical terminations; front edge straightened or slightly sub-concave *near the middle*; surface ridged by about 15 elevated narrow threads, parallel to the margin, separated by wider flat spaces, in which are fine striæ parallel to the elevated threads.

Locality.—In South Devon: Berry Pomeroy.

65*. NUCULA LATISSIMA, *pl.* 58, *fig.* 65.*

Character.—Surface not seen: its great width is the most remarkable circumstance.

Locality.—In North Devon: Pilton.

CONCHIFERA MESOMYONA.

80*. PECTEN PLICATUS, *pl.* 60, *fig.* 80*.

Ref.—Pecten plicatus. *Sowerby*, Min. Conch., *tab.* 574, *fig.* 3; Geol. of Yorkshire, *pl.* 6, *fig.* 21.

Though imperfect as to the ears, and weathered on the surface, there appears enough in the general air and striation of the shell to justify this reference.—(Only one specimen seen.)

Locality.—In South Devon: Newton.

CONCHIFERA BRACHIOPODA.

Family. ATHYRIDÆ.

102*. CALCEOLA SANDALINA, *pl.* 60, *fig.* 102*.

Ref.—*Lamarck*, Anim. sans Vertebres, tom. vi., *pl.* 234.

Mr. Austen, who has detected so many interesting forms in the rocks of South Devon, sent me sketches of many specimens of Calceola which he had found near West Ogwell: one of these I have copied, which shews the reverse and part of the interior of the conical valve, enough to identify this remarkable shell.

Locality.—In South Devon: Chircombe Bridge, near Newton.

104*. ORTHIS HARDRENSIS, *pl.* 58, *fig.* 104 *a, b, c, d*; and *pl.* 60, *fig.* 104*.

Character.—Nearly twice as wide as long, with rectangular or slightly acute and extended terminations to the hinge line, which is spiniferous; valves unequal, one convex, the other flat, or even a little concave; surface finely and rather subtilely striated from the beaks, the striæ being minutely crossed by lines of growth; internal surfaces of the shell often punctate, with large cordiform muscular depressions.

Locality.—In North Devon: Westleigh.

In South Devon: Berry Pomeroy; Meadsfoot Sands.

112**. ORTHIS CALCAR (?), *pl.* 58, *fig.* 112**.

A small orbicular shell, with about ten granulated radiating ribs.

Locality.—In North Devon: Pilton.

GASTEROPODA.

171*. EUOMPHALUS RADIATUS (?), *pl.* 60, *fig.* 171*.

Ref.—Euomphalus radiatus. *Goldfuss.*

Character.—Discoidally spiral, whorls nearly round in the section, sharply carinated on the lower concave surface, and radiated with curved prominent striæ; aperture expanding, with a lip thickened outwardly.

Though the curved striæ are not properly seen, I suppose this is the species indicated in MS. of Goldfuss, as from the Eifel.

Locality.—In South Devon: Newton.

172*. EUOMPHALUS ANNULATUS, *pl.* 60, *fig.* 172*.

Character.—Discoidally spiral, whorls round, ecarinate, ringed with many prominent equal threads.

Perhaps this is identical with the shell indicated and figured, pl. 36, fig. 172 *a, b.*

Locality.—In South Devon: Newton.

Genus. LOXONEMA.

187*. LOXONEMA RETICULATA, *pl.* 60, *fig.* 187*.

Character.—Elongated, spire of 8 or more convex volutions, slightly bordered above, and over the whole surface reticulated by raised longitudinal and spiral threads. The longitudinal threads are slightly sigmoidal.

Locality.—In South Devon: Newton.

Genus. MURCHISONIA.

190*. MURCHISONIA TRICINCTA, *pl.* 60, *fig.* 190*.

Ref.—Schizostoma tricincta. *Munster,* Beitrage, *pl.* 15, *fig.* 87.

This seems to come still nearer to the species figured by Munster than that given p. 102. The upper border of the whorls is not distinctly granulated; the two middle carinæ (the upper one most distinct) are very approximate, the lower one is sutural. There appear to be only the faintest traces of other spiral lines, but the cross striæ, bent at the band, are clear.

Locality.—In South Devon: Newton.

Genus. MACROCHEILUS.

194*. MACROCHEILUS ARCULATUS (?), *pl.* 60, *fig.* 194*.

The general figure of the shell, the arrangement and strength of the oblique elevated threads, make the specimen figured approach nearer to *Buccinum arculatum* (in a young state), than to *B. imbricatum,* or any other form with which I am acquainted.

Locality.—In South Devon: Newton.

CEPHALOPODA MONOTHALAMACEA.

Genus. BELLEROPHON.

203*. BELLEROPHON HIULCUS, *pl.* 58, *fig.* 203*.

Ref.—Bellerophon hiulcus. *Sowerby,* in Min. Conch., *tab.* 470.

The imperfect specimen figured, agrees better with Mr. Sowerby's figure and description than with any other species published from British specimens.

Locality.—Yealm Bridge, near Launceston.

CEPHALOPODA POLYTHALAMACEA.

Genus. ORTHOCERAS.

205*. ORTHOCERAS ELLIPSOIDEUM (?), *pl.* 60, *fig.* 205*.

Compare Orthoceras ventricosum. *Steininger*, Mem. Geol. Soc. of France, *pl.* 22, *fig.* 5.

In *Orthoceras ventricosum,* which this otherwise resembles, the siphuncle is marked as central; in this it is close to the dorsal edge, as in some Cyrtocerata. The last chamber was ellipsoidal; the section is oval; the siphon being on the conjugate axis.

Locality.—In South Devon: Newton.

227*. GONIATITES TRANSITORIUS, *pl.* 60, *fig.* 227*.

Compare Goniatites hybridus. *Munster*, Ann. des Sci. Nat., *pl.* 3, *fig.* 5,

Goniatites Dannebergi. *Beyrich*, *pl.* 1, *fig.* 5.

The angularity of the back is the most obvious mark of difference between this fossil and the two species mentioned above. In regard to the septum, it is much allied to them, and also to *Goniat. nautilinus* and *Goniat. expansus.*

Locality.—In South Devon: Newton.

SYNOPSIS OF THE SPECIES

AND THEIR

GEOGRAPHICAL DISTRIBUTION.

SYNOPSIS *of the* SPECIES, *and their* GEOGRAPHICAL DISTRIBUTION.

	References.		LOCALITIES.								In other parts of the British Islands.		Elsewhere in Europe.
			NORTHERN DISTRICT.				SOUTHERN DISTRICT.						
POLYPIARIA.	No.	Page.	Linton Group.	Ilfracombe Group.	Pilton Group.	Carbonac. Group.	Petherwin Group.	Plymouth Group.	South Cornwall Group.	Carbonaceous Group.	In the Lower Palæozoic Series.	In the Upper Palæozoic Series.	
Turbinolopsis celtica .	1	3	. .	. .	Brushford	. .	Petherwin, St. Columb	Mudstone, Plymouth, &c.	Fowey, Polruan	Combe	South-west of Ireland	. .	Kerliver, near Faon
,, bina . .	2	4	. .	. .	. .	. .	. .	. .	. .	Combe	Near Ludlow, Marloes Bay, Presteign		
,, pauciradialis	4	5	. .	. .	. .	Corffe Quarry							
,, pluriradialis	5	5	Linton	. .	Brushford	. .	. .	. .	Fowey				
Amplexus tortuosus .	8	8	. .	. .	. .	. .	Petherwin	Plymouth, Barton	. .	. .	. .	Clane, Kildare	
Cyathophyllum turbinatum	9	8	. .	. .	. .	. .	. .	Babbacombe, Plymouth	. .	. .	Wenlock, Dudley, &c.	. .	Eifel, Gottland, &c.
,, cæspitosum	10	9	. .	Combe Martin, Hagginton, Hillsborough	. .	. .	Petherwin	Dartington, Newton, Plymouth, &c.	. .	. .	Wenlock	. .	Eifel, &c.
Cystiphyllum Damnoniense	11	9	. .	Cannington Park	. .	. .	. .	Newton, Babbacombe					
,, vesiculosum	12	10	. .	. .	. .	. .	. .	Babbacombe	. .	. .	. .	. .	Eifel
Strombodes helianthoides	13	10	. .	. .	. .	. .	. .	Plymouth, Babbacombe	. .	. .	. .	. .	Eifel
,, vermicularis	14	11	. .	Hagginton ?	. .	. .	. .	Newton, Dartington	. .	. .	. .	. .	Eifel
Astræa pentagona . .	15	11	. .	. .	. .	. .	. .	Plymouth, Torquay	. .	. .	. .	. .	Namur
,, Hennahii . .	16	12	. .	. .	. .	. .	. .	Barton, Newton					
,, intercellulosa .	17	12	. .	. .	. .	. .	. .	Torquay					
Porites pyriformis . .	19	14	. .	. .	. .	. .	. .	Babbacombe, Plymouth	. .	. .	Wenlock, Coniston	. .	Eifel, &c.
Favosites polymorpha .	20	15	Linton	Combe Martin, Hagginton, &c.	. .	. .	. .	Babbacombe, Sharkham, &c.	Polruan	. .	Ludlow	. .	Bensberg
,, Gottlandica .	21	16	. .	. .	. .	. .	. .	Sharkham, Babbacombe	. .	. .	Ludlow	. .	Gottland, Eifel

,, spongites .	23	16	. .	. .	. .	. .	. .	Babbacombe, Hope, Mudstone Bay, &c.	. .	. .	Wenlock		Eifel
,, fibrosa . .	25	17	. .	Hillsborough CombeMartin	?	. .	. .	Dartington, Sharkham, &c.	. .	. .	Aymestry, &c.	. .	Eifel
Manon cribrosum . .	26	17	. .	. .	Brushford, Pilton	. .	. .	. .	. .	. .	. .	. .	Eifel
Stromatopora polymorpha	27	18	. .	. .	. .	. .	. .	Dartington, Chudleigh	. .	. .	. .	. .	Eifel
,, concentrica	28	18	. .	. .	. .	. .	. .	Chudleigh, Torquay	. .	. .	Dudley, &c.	. .	Eifel
Caunopora placenta .	29	18	. .	. .	. .	. .	. .	Plymouth, Torquay	. .	. .	. .	. .	Eifel
,, ramosa . .	22	19	. .	. .	. .	. .	. .	Chudleigh	. .	. .	. .	. .	Beusberg
Pleurodictyum problematicum	24	16, 19	. .	. .	. .	. .	. .	Meadsfoot, West Ogwell	. .	. .	. .	. .	Westphalia
Gorgonia ripisteria .	30	20	. .	. .	. .	. .	. .	Mudstone Bay	. .	. .	. .	. .	Tournai
Millepora gracilis . .	31	20	. .	. .	Brushford, Pilton, Croyde								
,, similis . .	32	21	. .	Cannington Park	. .	. .	. .	Chudleigh, Hope					
Glauconome bipinnata	33	21	. .	. .	Brushford, Pilton, Croyde								
Fenestella laxa . . .	34	23	. .	. .	Croyde	. .	Petherwin	Hope	. .	. .	. .	Kildare, Whitewell	
,, antiqua . .	35	24	Linton, Watersmeet, Lee, Woodabay	. .	Pilton, Croyde, Brushford	. .	Petherwin	Hope, Barton					
,, arthritica .	36	25	. .	Hagginton	. .	. .	. .	Hope					
Retepora prisca . .	37	25	. .	. .	. .	. .	. .	Plymouth, Barton	. .	. .	. .	. .	Eifel
Hemitrypa oculata . .	38	27	. .	. .	. .	. .	. .	Barton, Hope					
—													
CRINOIDEA.													
Platycrinus interscapularis	39	28	. .	. .	. .	. .	. .	Newton, Plymouth					
Platycrinus tuberculatus?	39*	134	. .	. .	. .	. .	. .	Newton	. .	. .	. .	Whitewell	
,, pentangularis?	39**	135	. .	. .	. .	. .	. .	Newton	. .	. .	. .	Bristol	
Pentremites ovalis . .	40	29	. .	. .	Brushford	. .	. .	. .	. .	. .	. .	. .	Eifel

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	References.		LOCALITIES.								In other parts of the British Islands.		Elsewhere in Europe.
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Cyathocrinus macrodactylus	41	29	. .	. .	Pilton, Brushford								
Cyathocrinus geometricus	41*	135	. .	. .	. .	. .	. .	Newton	. .	. .	. .	. .	Eifel
Adelocrinus hystrix .	42	30	. .	. .	Brushford								
Actinocrinus 30-dactylus	43	31	. .	. .	. .	. .	. .	Newton	. .	. .	. .	Ireland, Yorkshire, &c	Eifel
Crinoidal columns													
Actinocrinus? tenuistriatus	44	31	Linton	. .	Pilton								
Cyathocrinus? pinnatus	45	31	. .	. .	Saunton	. .	. .	Mudstone Bay	. .	West of Ashburton	. .	.	Eifel
Cyathocrinus? nodulosus	46	32	. .	. .	. .	. .	. .	Hope, near Torquay					
Cyathocrinus? megastylus	47	32	. .	. .	. .	. .	. .	Whitesand Bay	. .	. .	. .	Whitewell	
Cyathocrinus? variabilis	48	32	. .	Ilfracombe	Pilton	. .	Petherwin						
Cyathocrinus? ellipticus	49	32	. .	. .	. .	. .	Petherwin						
Cyathocrinus ? distans	49*	135	. .	. .	. .	Coddon Hill							
Sphæronites tessellatus	49**	135	. .	. .	. .	. .	. .	Plymouth, St. Mary Church					
—													
CONCHIFERA PLAGIMYONA.													
Pleurorhynchus minax	50	33	. .	. .	. .	Hilberton	. .	Bradley . .	. .	. .	. .	Kildare, Whitewell	Ratingen
,, aliformis	51	34	. .	. .	. .	. .	. .	Barton, Plymouth	. .	. .	. .	Whitewell	Eifel
Sanguinolaria sulcata .	52	34	. .	. .	. .	. .	Petherwin	.	. .	Combe	Aymestry ?	. .	Schubelhammer
,, elliptica	53	34	. .	. .	. .	. .	. .	. .	. .	Combe			

,, lirata. .	53*	136	. .	. .	Pilton								
Pullastra elliptica . .	54	35	. .	. .	. .	. .	Petherwin						
,, antiqua . .	55	35	. .	. .	P lton								
,, complanata .	56	35	. .	. .	Pilton	. .	. .	. .	. .	. .	Bridgnorth, &c.		
Cypricardia semisulcata	57	36	. .	. .	. .	. .	Petherwin	. .	. .	. .	Aymestry		
,, impressa .	58	36	. .	. .	Baggy Point	. .	Petherwin	. .	. .	. .	Near Ludlow		
,, deltoidea .	59	37	. .	. .	. .	. .	Petherwin						
Megalodon cucullatum .	60	37	. .	. .	. .	. .	. .	Bradley	. .	. .	. .	. .	Eifel
,, carinatum .	60*	136	. .	. .	. .	. .	. .	Newtou	. .	. .	. .	. .	Eifel
Mytilus Damnoniensis.	61	37	. .	. .	. .	. .	. .	Newton					
Modiola amygdalina .	62	38	. .	. .	. .	. .	Petherwin						
,, scalaris . .	62*	137	. .	. .	. .	. .	. .	Berry Pomeroy	.				
Nucula plicata . . .	63	38	. .	. .	Baggy Point								
,, lineata . . .	64	39	. .	. .	Baggy Point								
,, ovata . . .	65	39	. .	. .	Pilton? .	. .	. .	Meadsfoot .	. .	. .	Horeb Chapel		
,, latissima . .	65*	137	. .	. .	Pilton								
Cucullæa amygdalina .	66	40	. .	. .	Marwood								
,, Hardingii .	67	40	. .	. .	Marwood								
,, angusta . .	68	41	. .	. .	Marwood								
,, unilateralis .	69	41	. .	. .	Marwood								
,, trapezium .	70	41	. .	. .	Marwood								
,, depressa . .	71	42											
CONCHIFERA MESOMYONA.													
Posidonia tuberculata .	72	44	. .	. .	. .	Venn, Swimbridge	. .	. .	. .	. .	. .	Northumberland, (Sowerby)	
,, Becheri . .	73	45	. .	. .	. .	Venn, Swimbridge, Westleigh, &c.	. .	. .	. .	Lew Trenchard, Truscot	. .	. .	Herborn, Runderath, and Beringhausen.
,, lateralis . .	74	45	. .	. .	. .	Venn .	. .	. .	.	Lew Trenchard			. .
Pecten granulosus . .	75	46	. .	. .	. .	. .	Landlake						
,, polytrichus . .	76	46	. .	. .	Brushford	. .	. .	Mudstone Bay					
,, transversus .	77	46	. .	. .	Pilton, Brushford, Croyde	. .	Petherwin	. .	. .	. .	. .	. .	Eifel, Iserlohn
,, alternatus . .	78	47	. .	. .	. .	. .	Petherwin						
,, rugosus . . .	79	47	. .	. .	. .	. .	. .	Babbacombe					
,, arachnoideus .	80	47	. .	. .	. .	. .	Petherwin						

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Pecten plicatus . . .	80*	137	. .	. .	. .	. .	. .	Newton	. .	. .	. .	Ireland	
Pterinea spinosa . .	81	48	Woodabay										
,, ventricosa .	82	49	. .	. .	. .	. .	Petherwin	. .	. .	. .	. .	. .	Iserlohn
Avicula anisota . .	83	49	. .	. .	. .	. .	. .	Meadsfoot	. .	. .	. .	. .	Ems
,, cancellata . .	84	49	. .	. .	Baggy Point, Croyde								
,, rudis . . .	85	50	. .	. .	Brushford, Pilton								
,, subradiata . .	86	50	. .	. .	. .	. .	Petherwin						
,, texturata . .	87	50	. .	. .	. .	. .	. .	Barton, Plymouth					
,, reticulata . .	88	51	. .	. .	. .	. .	. .	Newton, Barton	. .	. .	. .	. .	Eifel
,, exarata . .	89	51	. .	. .	. .	. .	Petherwin						
,, Damnoniensis	90–92	51	. .	. .	Marwood								
CONCHIFERA BRACHIOPODA.													
Leptæna analoga . .	93	56	. .	. .	Croyde, Pilton	. .	. .	. .	. .	. .	. .	Ireland, Derbyshire	
,, nodulosa . .	94	56	. .	. .	. .	. .	. .	Hope, Newton	. .	. .	. .	. .	Eifel
,, rugosa. . .	95	57	. .	. .	. .	. .	. .	Newton, Plymouth	. .	. .	. .	. .	Eifel, Gottland, &.
,, convoluta . .	96	57	. .	. .	Croyde								
,, scabricula .	97	58	. .	. .	Brushford, Pilton	. .	. .	. .	. .	. .	. .	North of England, &c	
,, caperata . .	98	58	. .	. .	Croyde	. .	Petherwin						
,, laxispina .	99	59	. .	. .	. .	. .	Petherwin	. .	. .	. .	. .	Moulton	
,, fragaria . .	100	59	. .	. .	. .	. .	Petherwin	Barton,Newton					
,, membranacea	101	60	. .	. .	Pilton	. .	Petherwin						
,, mesoloba . .	102	61	. .	. .	. .	Coddon Hill	. .	. .	. .	. .	. .	Ireland, Whitewell	
Calceola sandalina . .	102*	137	. .	. .	. .	. .	. .	Chircombe Bridge	. .	. .	. .	. .	Eifel

Orthis interstrialis .	103	61	. .	. .	. .	. .	. .	Barton					
,, sordida . . .	104	62	Linton	. .	. .	. .	. .	Meadsfoot					
,, Hardrensis . .	104*	138	. .	. .	. .	Westleigh	. .	Berry Pomeroy	. .	. .	. .	Hardrow, &c.	
,, longisulcata .	105	62	Linton, Woodabay										
,, interlineata . .	106	63	Woodabay	. .	Brushford, Croyde	. .	Petherwin	. .	. .	Combe			
,, arcuata . . .	107	64	. .	. .	. .	. .	. .	Hope					
,, plicata . . .	108	64	. .	. .	Brushford	. .	. .	Meadsfoot					
,, parallela . . .	109	64	. .	. .	Pilton, Brushford, Croyde	. .	Petherwin						
,, lens	110	65	. .	. .	. .	. .	. .	Hope					
,, granulosa . .	111	65	Woodabay, Linton	. .	. .	. .	. .	Meadfoot					
,, compressa . .	112*	66	Linton	. .	Pilton	. .	. .	Hope	. .	. .	Hope quarry, near Shelve		
,, calcar	112**	138	. .	. .	Pilton								
,, semicircularis .	112	65	. .	. .	Pilton	. .	. .	. .	. .	. .	Hope quarry, near Shelve		
,, crenistria . .	113	66	. .	. .	. .	. .	. .	Plymouth, Hope, Dartington	. .	. .	. .	Ireland, Yorkshire, Kendal	Eifel(young)
,, arachnoidea . .	114	67	. .	. .	. .	. .	. .	Hope	. .	. .	. .	Northumberland, Ireland	
,, resupinata . .	115	67	. .	. .	. .	. .	. .	Barton, Newton	. .	. .	. .	Ireland, Derbyshire, &c.	Eifel
Spirifera microgemma .	116	68	. .	. .	Brushford	. .	. .	Hope					
,, oblata . .	117	68	. .	. .	. .	. .	. .	Newton	. .	. .	. .	Ireland, Derbyshire	Eifel
,, protensa . .	118	69	. .	. .	. .	. .	Petherwin						
,, unguiculus .	119	69	. .	. .	Brushford, Pilton	. .	Petherwin	Barton					
,, lineata . .	120*a*	70	. .	. .	. .	. .	Petherwin	. .	. .	. .	. .	Derbyshire, &c.	
,, decussata . .	120*b*	70	. .	. .	Brushford, Pilton, Baggy Point	. .	Petherwin						
,, plebeia . .	121	70	. .	. .	. .	. .	. .	Barton	. .	. .	. .	. .	Elbersreuth Eifel
,, hirundo . . .	122	71	. .	. .	. .	. .	. .	Hope					
,, phalæna . .	123	71	. .	. .	. .	. .	. .	Hope					
,, simplex . .	124*α*	71	. .	. .	. .	. .	. .	Plymouth, Newton					
,, cuspidata . .	124*β*	72	. .	. .	. .	. .	. .	Barton	. .	. .	. .	Ireland, Derbyshire, &c.	Eifel
,, heteroclita .	125	72	. .	. .	. .	. .	. .	Barton	. .	. .	. .	. .	Eifel

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Spirifera subconica .	126	72	. .	. .	. .	. .	. .	Barton	. .	: .	. .	. .	Eifel
,, distans . .	127	73	. .	. .	. .	. .	. .	Barton, Hope	. .	. .	. .	Ireland	
,, calcarata .	128	73	. .	. .	Baggy, Saunton, Croyde	. .	Petherwin					.	
,, disjuncta . .	129	74	. .	. .	Baggy Point	. .	Petherwin	Hope					
,, gigantea . .	130	75	. .	. .	. .	. .	Tintagel, Petherwin						
,, grandæva . .	131	76	. .	. .	. .	. .	Petherwin						
,, ostiolata . .	132	76	Linton	. .	. .	. .	. .	. .	. .	. .	. .	Whitewell	Eifel
,, aperturata .	133	77	Linton	. .	. .	. .	. .	. .	. .	. .	. .	. .	Eifel
,, costata . .	134	77	. .	. .	. .	. .	. .	Meadsfoot, Hope					
,, speciosa . .	134*	77	. .	. .	. .	. .	. .	Torquay	. .	. .	. .	. .	Eifel
,, obliterata .	135	78	. .	. .	Brushford								
,, rudis . . .	136	78	. .	. .	Baggy Point								
,, mesomala .	137	78	. .	. .	Brushford								
,, nuda . . .	188	78	. :	. .	. .	. .	. .	Plymouth, Hope, Barton					
,, rotundata . .	139	79	. .	. .	. .	. .	. .	Barton	. .	. .	. .	Kildare, Whitewell	
,, megaloba . .	140	79	. .	. .	Brushford								
Strigocephalus Burtini .	141	79	. .	Combe Martin	. .	. .	. .	Bradley	. .	. .	. .	. .	Bensberg, &c.
,, giganteus .	142	80	. .	. .	. .	. .	. .	Plymouth	. .	. .	. .	. .	Bensberg, &c.
,, brevirostris	143	80	. .	. .	. .	. .	. .	Newton					
Atrypa aspera . . .	144	81	. .	. .	. .	. .	. .	Newton, Hope	. .	. .	. .	. .	Eifel
,, prisca . . .	145	81	. .	. .	. .	. .	. .	Hope, Barton, Plymouth	. .	. .	Ludlow, Wenlock	. .	Eifel
,, desquamata .	146	82	. .	. .	. .	. .	Petherwin	Newton, Plymouth					
,, insperata . .	147	83	. .	. .	. .	Coddon Hill							
,, cassidea . .	148	83	. .	. .	. .	. .	. .	Newton	. .	. .	. .	. .	Sweden
Terebratula proboscidalis	149	84	. .	. .	. .	. .	. .	Hope					
,, cuboides .	150	84	. .	. .	. .	. .	. .	Hope					
,, bifera . .	151	84	. .	. .	. .	. .	. .	Hope					

,, crenulata .	152	85	. .	. .	. .	. .	. .	Barton					
,, laticosta .	153	85	. .	. .	Baggy Point								
,, anisodonta	154	86	. .	. .	. .	. .	. .	Barton					
,, pleurodon .	155	86	. .	. .	Croyde, Pilton, Brushford, Baggy Point	. .	Petherwin	. .	. .	. .	. .	Whitewell, &c.	
,, pugnus . .	156	87	. .	. .	. .	. .	. .	Barton	. .	. .	. .	Whitewell, &c.	
,, reniformis .	157	88	. .	. .	. .	. .	. .	Barton, Hope	. .	. .	. .	Whitewell, &c.	
,, rhomboidea	158	88	. .	. .	. .	. .	. .	Barton	. .	. .	. .	Whitewell, &c.	
,, acuminata	159	88	. .	. .	. .	. .	. .	Newton	. .	. .	. .	Whitewell, &c.	Eifel
,, amblygona	160	88	. .	. .	. .	. .	. .	Barton					
,, comta . .	161	89	. .	. .	. .	. .	. .	Barton	. .	. .	. .	. .	Eifel
,, angularis .	162	89	. .	. .	. .	. .	. .	Barton, Newton	. .	. .	. .	. .	Eifel
,, ferita . .	163	89	. .	. .	. .	. .	. .	Barton	. .	. .	. .	. .	Eifel
,, subdentata.	164	90	. .	. .	. .	. .	Petherwin						
,, juvenis . .	165	90	. .	. .	. .	. .	. .	Barton					
,, sacculus .	166	91	. .	. .	. .	. .	. .	Barton	. .	. .	. .	Derbyshire, Ireland	
,, virgo . .	167	91	. .	. .	. .	. .	. .	Barton	. .	. .	. .	Derbyshire, &c.	
,, hastata ? .	168	91	. .	. .	. .	. .	. .	Newton					Eifel
—													
GASTEROPODA.													
Acroculia vetusta . .	169	93	. .	. .	Brushford	. .	. .	Newton	. .	. .	Ludlow	Whitewell	
,, sigmoidalis .	170	94	. .	. .	. .	. .	. .	Hope					
Euomphalus circularis .	171	94	. .	. .	. .	. .	. .	Newton					
,, radiatus .	171*	138	. .	. .	. .	. .	. .	Newton	. .	. .	. .	. .	Eifel
,, serpens .	172	94	. .	. .	Brushford	. .	Petherwin	Meadsfoot, Newton					
,, annulatus.	172*	138	. .	. .	. .	. .	. .	Newton					
Natica meridionalis .	173	94	. .	. .	Baggy Point								
,, nexicosta . .	174	95	. .	. .	. .	. .	Petherwin						
Turbo texatus . . .	175	95	. .	. .	. .	. .	. .	Newton	. .	. .	. .	. .	Elbersreuth
Pleurotomaria cancellata	176	96	. .	. .	Brushford	. .	Petherwin	Newton					
,, antitorquata	176*d*	96	. .	. .	. .	. .	Petherwin	Newton	. .	. .	. .	. .	Schubel-hammer
,, aspera . .	177	96	Woodabay	. .	Pilton	. .	Petherwin	Newton					
,, monilifera	178	97	. .	. .	. .	. .	. .	Newton	. .	. .	. .	Bolland	
,, expansa .	179	97	. .	. .	Baggy Point	. .	. .	. .	. .	. .	. .	Bolland	
,, impendens	180	97	. .	. .	. .	. .	. .	Hope, Newton					
,, gracilis .	181	98	. .	. .	Brushford, Baggy Point								

Synopsis *of the* Species, *and their* Geographical Distribution—*continued.*

	References.		LOCALITIES.								In other parts of the British Islands.		Elsewhere in Europe.
			NORTHERN DISTRICT.				SOUTHERN DISTRICT.						
	No.	Page.	Linton Group.	Ilfracombe Group.	Pilton Group.	Carbonac. Group.	Petherwin Group.	Plymouth Group.	South Cornwall Group.	Carbonaceous Group.	In the Lower Palæozoic Series.	In the Upper Palæozoic, Series.	
Gasteropoda—*continued.*													
Loxonema sinuosa ? .	182	99	. .	. .	. .	. .	Petherwin	. .	. .	. .	Aymestry		
,, nexilis . .	183	99	. .	. .	. .	. .	Petherwin	Newton	. .	. .	. .	. .	Schubelhammer
,, Hennahiana .	184	99	. .	. .	. .	. .	. .	Plymouth Barton					
,, lincta . . .	185	100	. .	.	. .	. .	. .						
,, tumida . .	186	100	. .	. .	. .	. .	Petherwin	. .	. .	. .	. .	Ireland, Bolland	
,, præterita . .	187	100	. .	. .	. .	. .	. .	Newton, Chudleigh, Hope					
,, reticulata .	187*	139	. .	. .	. .	. .	. .	Newton					
,, rugifera . .	188	101	. .	. .	Brushford	. .	. .	. .	. .	. .	. .	Northumber Bolland, Kendal	
Murchisonia angulata .	189	101	. .	. .	Brushford	. .	Petherwin	. .	. .	. .	. .		
,, geminata .	190	102	. .	. .	. .	. .	. .	Newton	. .	. .	. .	. .	Elbersreuth
,, trincincta .	190*	139	. .	. .	. .	. .	. .	Newton					
,, bilineata .	191	102	. .	. .	. .	. .	. .	Newton	. .	. .	. .	. .	Eifel
,, spinosa .	192	102	. .	. .	. .	. .	. .	Bradley	. .	. .	. .	Whitewell	Eifel
Macrocheilus brevis .	193	103	. .	. .	. .	. .	. .	Bradley					
,, imbricatus	194	104	. .	. .	. .	. .	. .	Bradley					
,, arculatus	194*	139	. .	. .	. .	. .	. .	Newton	. .	. .	. .	. .	Eifel
,, acutus .		104	. .	. .	. .	. .	. .	Stonehouse Hill	. .	. .	. .	Whitewell	
,, elongatus	195	104	. .	. .	. .	. .	. .	Newton					
,, neglectus	196	105	. .	. .	Brushford								
,, harpula .	197	105	. .	. .	. .	. .	. .	Bradley	. .	. .	. .	. .	Eifel
CEPHALOPODA MONOTHALAMACEA.													
Bellerophon striatus .	198	106	. .	. .	. .	. .	. .	Newton	. .	. .	. .	. .	Bensberg
,, Urii . .	199	106	. .	. .	Pilton, Baggy Point	. .	. .	. .	. .	. .	. .	Otterburn, Linlithgowshire	
,, trilobatus .	200	107	. .	. .	Baggy Point	. .	Petherwin	Meadsfoot	. .	. .	Felindre		

,, Woodwardii	201	107	. .	. .	. .	. .	. .	Newton	. .	. .	. .	Ireland, Derbyshire	
,, globatus .	202	108	Woodabay	. .	Pilton, Brushford, Marwood	. .	. .	. .	. .	. .	Felindre, Ludlow		
,, Wenlockensis	203	108	. .	. .	. .	. .	. .	Newton	. .	. .	Wenlock, Wigmore		
,, hiulcus .	203*	139	. .	. .	. .	. .	YealmBridge	. .	. .	. .	. .	North of England	
CEPHALOPODA POLYTHALAMACEA.													
Orthoceras cinctum. .	204	109	. .	. .	. .	. .	Petherwin	Newton	. .	. .	. .	Bolland, Kildare, &c.	
,, laterale . .	205	110	. .	. .	. .	. .	Petherwin	Newton	. .	. .	. .	Kildare, Whitewell	
,, ellipsoideum	205*	140	. .	. .	. .	. .	. .	Newton	.				
,, Ludense .	206	110	Woodabay	. .	Marwood	. .	Petherwin	. .	. .	. .	Ludlow, &c.		
,, imbricatum	207	111	. .	. .	Marwood	. .							
,, ibex. . .	208	111	. .	. .	. .	. .	Petherwin	. .	. .	. .	Ludlow		
,, lineolatum.	209	111	. .	. .	Croyde	. .	. .	. .	. .	. .	. .	Northumberland, &c.	
,, tentaculare	210	112	. .	. .	Baggy Point, Brushford	. .	. .	Meadsfoot					
,, tubicinella.	211	112	. .	. .	. .	. .	. .	Newton	. .	. .	. .	. .	Westphalia
,, striatulum .	212	112	. .	. .	. .	. .	Petherwin						
,, cylindraceum	213	113	. .	. .	Baggy ?	Swimbridge							
Cyrtoceras fimbriatum	214	114	. .	. .	. .	. .	. .	Newton					
,, tredecimale .	215	114	. .	. .	. .	. .	. .	Newton	. .	. .	. .	. .	Eifel
,, quindecimale	216	114	. .	. .	. .	. .	. .	Newton					
,, ornatum .	217	115	. .	. .	. .	. .	. .	Newton	. .	. .	. .	. .	Eifel
,, obliquatum .	218	115	. .	. .	. .	. .	. .	Newton					
,, marginale .	219	115	. .	. .	. .	. .	. .	Newton					
,, nautiloideum	220	116	. .	. .	. .	. .	. .	Newton					
,, nodosum .	221	116	. .	. .	. .	. .	. .	Newton	. .	. .	. .	. .	Eifel
,, rusticum .	222	116	. .	. .	. .	. .	Petherwin						
,, bdellalites .	223	117	. .	. .	. .	. .	. .	Mudstone Bay, Babbacombe					
,, reticulatum .	224	117	. .	. .	. .	. .	. .	Newton					
,, armatum .	225	118	. .	. .	. .	. .	. .	Newton					
Nautilus germanus .	226	118	. .	. .	. .	. .	. .	Newton					
,, megasiphe .	227	119	. .	. .	. .	. .	Petherwin						
Goniatites transitorius .	227*	140	. .	. .	. .	. .	. .	Newton					

SYNOPSIS *of the* SPECIES, *and their* GEOGRAPHICAL DISTRIBUTION—*continued.*

	References.		LOCALITIES.								In other parts of the British Islands.		Elsewhere in Europe.
			NORTHERN DISTRICT.				SOUTHERN DISTRICT.						
	No.	Page.	Linton Group.	Ilfracombe Group.	Pilton Group.	Carbonac. Group.	Petherwin Group.	Plymouth Group.	South Cornwall Group.	Carbonaceous Group.	In the Lower Palæozoic Series.	In the Upper Palæozoic Series.	
CEPHALOPODA POLYTHALAMACEA—*continued.*													
Goniatites insignis . .	228	119	. .	. .	. .	. .	Petherwin						
,, linearis . .	229	120	. .	. .	. .	. .	Petherwin	. .	. .	. .	. .	. .	Fichtelgebirge
,, biferus . .	230	120	. .	. .	. .	. .	Petherwin						
,, globosus . .	231	120	. .	. .	. .	. .	. .	Newton	. .	. .	. .	. .	Fichtelgebirge
,, excavatus .	232	121	. .	. .	. .	. .	. .	Newton					
,, spiralis . .	233	121	. .	. .	. .	Bampton	. .	. .	. .	. .	. .	North of England Kildare, Whitewell, &c.	
,, crenistria .	234	121	. .	. .	. .	Swimbridge	. .	. .	. .	Truscott	. .		
,, mixolobus .	235	122	. .	. .	. .	Westleigh, Bampton, Coddon Hill	. .	. .	. .	Truscott, Combe, Lew Trenchard	. .	Bolland	
,, spirorbis . .	236	122	. .	. .	. .	Westleigh	. .	. .	. .	. .	. .	Bolland	
,, serpentinus .	237	123	. .	. .	. .	. .	. .	Newton	. .	Exeter	. .	Bolland	
,, inconstans .	238	123											
Clymenia lævigata . .	239	124	. .	. .	. .	. .	Petherwin	. .	. .	. .	. .	. .	Fichtelgebirge
,, striata . .	240	125	. .	. .	. .	. .	Petherwin	. .	. .	. .	. .	. .	Fichtelgebirge
,, linearis . .	241	125	. .	. .	. .	. .	Petherwin	. .	. .	. .	. .	. .	Fichtelgebirge
,, fasciata . .	242	125	. .	. .	. .	. .	Petherwin						
,, sagittalis .	243	125	. .	. .	. .	. .	Petherwin						
,, plurisepta .	244	126	. .	. .	. .	. .	Petherwin						
,, valida . .	245	126	. .	. .	. .	. .	Petherwin						
CRUSTACEA.													
Harpes macrocephalus	246	127	. .	. .	. .	. .	. .	Barton	. .	. .	. .	. .	Eifel
Calymene sternbergii .	247	128	. .	. .	. .	. .	. .	Barton	. .	. .	. .	. .	Elbersreuth

.. granulata .	248	128	. .	. .	. .	. .	Petherwin	Hope	. .	. .	. .	. .	Schubel-hammer
,, accipitrina .	249	129	. .	. .	Saunton, Pilton, Brushford	. .	. .	Hope, Barton, Mudstone Bay	. .	. .	. .	. .	Eifel
,, lævis . . .	250	129	. .	. .	Brushford	. .	. .	Mudstone Bay, Durlstone, Newton	. .	. .	. .	. .	Elbersreuth
Asaphus granuliferus .	251	130	. .	. .	. .	. .	. .	Hope	. .	. .	. .	Tyrone, &c.	
,, indeterminate	252	130	. .	. .	. .	. .	. .	Hope					
Homalonotus . . .	253	130	. .	. .	. .	. .	. .	Meadsfoot	. .	. .	Ludlow, &c		
Brontes flabellifer . .	254	131	. .	. .	. .	. .	. .	Hope, Newton	. .	. .	. .	. .	Eifel
FISHES.													
Holoptychus, scale .	256	132	. .	. .	. .	. .	. .	Meadsfoot					
,, scale .	257	132	. .	. .	Baggy Point								

Microscopic Foraminifera and very minute corals occur in the limestones of Cannington Park, and South Devon.

SUMMARY *of the* SYNOPTICAL TABLES, *with reference only to* CORNWALL, DEVON, *and* WEST SOMERSET.

Families which occur in the several Districts of Country and Groups of Strata; the Number of Species being marked in the several Columns.	Total of Species A.	Sum of Numbers in the several Groups B.	$\frac{B}{A}$ Mean Value = 1·28.	LOCALITIES.							
				NORTHERN DISTRICT.				SOUTHERN DISTRICT.			
				Linton Group.	Ilfracombe Group.	Pilton Group.	Carbonaceous Group.	Petherwin Group.	Plymouth Group.	South Cornwall Group.	Carbonaceous Group.
Polypiaria	34	55	1·64	3	6	7	1	5	28	3	2
Crinoidea	16	21	1·31	1	1	6	1	2	9	..	1
Conchifera Plagimyona	26	28	1·08	..	..	13	1	6	6	..	2
,, Mesomyona	20	23	1·15	1	..	4	3	7	6	..	2
,, Brachiopoda	83	105	1·26	7	1	22	3	16	55	..	1
Gasteropoda	36	47	1·30	1	..	10	..	9	27	..	..
Cephalopoda Monothalamacea	7	10	1·43	1	..	3	..	2	4	..	..
,, Polythalamacea	44	52	1.18	1	..	5	5	17	21	..	3
Crustacea	9	12	1·33	..	..	2	..	1	9	..	..
Fishes	2	2	1·00	..	..	1	..	..	1	..	..
Sums of the Columns, and mean value of $\frac{B}{A}$	277	355	1·28	15	8	73	14	65	166	3	11

The numbers in the column $\frac{B}{A}$ represent the value (from these observations) of what may be called the *function of distributiveness* of the several natural groups. Thus, taking notice of those where A and B are considerable, and therefore the value of $\frac{B}{A}$ probably least inexact, we have Polypiaria most distributed, and Polythalamacea among the most local. This is probably an instance of a general truth. In illustration, we may notice the occurrence of several of the Corals in the Eifel, the Wenlock Limestone, the Swedish Limestone, the Slaty rocks of Ayrshire, the Limestones of Westmoreland, &c.; while the Clymeniæ in particular seem to be concentrated in a few situations abundantly. Nearly as Count Munster finds the Clymeniæ in calcareous beds, in the Fichtelgebirge, and with nearly similar accompaniments, they are met with in the Limestone nodules at South Petherwin.

NOTICES AND INFERENCES

REGARDING THE

PALÆOZOIC FOSSILS OF DEVON AND CORNWALL.

THE stratified rocks of South Devon and Cornwall, which are older than the red sandstones of Teignmouth and Exeter, form one almost continuous range from Torbay, by Plymouth and Falmouth, to the granite of the Land's End, and are expanded across the axis of Cornwall to St. Agnes, Padstow, Tintagel, and Launceston. They possess the characters of one considerable sequence of marine depositions, principally argillaceous, partly arenaceous, locally calcareous, nearly all occasionally fossiliferous, the organic remains being almost exclusively of the radiated, molluscous, or annular types of organization, with a few traces of plants.

Similarly in West Somerset and North Devon, the stratified rocks, which are older than the red sandstone of Tiverton and Wiveliscombe, occupy in one continuous range nearly the whole north coast of Devon, from Minehead to Morte Bay. They also possess the character of a complete system of almost wholly marine deposits, argillaceous, arenaceous, and locally calcareous, nearly all occasionally fossiliferous, the organic remains being of the radiated, molluscous, or annular types of structure, with a few intermixtures of terrestrial plants.

The similarity between the strata of these two districts, in mineral characters and colours, superinduced structures, succession of the different rocks, and prevalent types of organization, is such, that their close relationship, and proximate geological age, have never been doubted. But what that age is, or in other words, what place should be assigned to either on the general scale of British or European strata, is to be determined by processes neither obvious, direct, nor easy. For these parts of Devon and Cornwall are not only unconnected with other districts by strata of equal or approximate antiquity, but moreover, in addition to this geographical insulation, they are also geologically insulated. They do not exhibit a complete geological sequence; there is no certain base line to start from among the lowest of these strata, and the uppermost of them are unconformed in position to those which follow next above.

Here, then, is a series of strata whose geological age is a problem incapable of solution, except by the application of general geological truths, to the interpretation of the internal evidence which the component parts of the system may contain.

Such evidence may be classed and valued in four divisions:—

1. The *chemical composition* of the rocks.
2. Their *mineral aspect*.
3. The succession or *series* of the component rocks.
4. Their organic *contents*.

By comparing, under each of these heads, the older strata of Devon and Cornwall, with those most nearly resembling them in other districts, we obtain as many estimates of the degree of analogy existing between them, and may immediately conclude on the identity, similarity, or difference of circumstances under which they were deposited. But to determine from these data at all, however rudely, the geological age of the strata in question, requires a knowledge of the law of nature which connects the peculiarities of the strata with the time of their deposition, or in other words, a history of the successive operations and conditions of the ancient sea.

That we possess such knowledge to a considerable extent, is certain, for the acquisition of it has been the object and glory of modern geological science. But it is least perfect exactly in the part of the series where we most want it, for the purpose of explaining the mystery of the Devonshire strata.

The *chemical composition* of rocks is seldom in any important degree characteristic of geological age, except when the strata taken into account are of an unusual order of composition, as magnesian limestone, ironstone, coal, chert. Merely argillaceous, arenaceous, and calcareous rocks belong to the systems of strata of every age, and are, chemically considered, characteristic of none. The Devonshire strata cannot by any chemical examination be determined in age, except there be amongst them something unusual. Of this kind there is, we believe, nothing but the peculiar condition of the colouring matter in the grits and slates, the former being often red, the latter light green or purple.

Light green and purple colours occur amidst the Westmorland and Cumberland slates, and amidst those of North Wales and Charnwood Forest: red grits and shales occur in the North of England and in Scotland, alternating with the lower beds of the mountain limestone; and on the border of Wales the old red sandstone lies upon older fossiliferous rocks. We have, therefore, in Devonshire, an intermixture of the types of old red sandstone and of ancient slate rocks. It is not a gradation but an alternation of these contrasted types, as if into the same oceanic basin were poured, at successive times, materials of unlike qualities from different points; just as has been shewn to be the fact with respect both to the carboniferous and oolitic tracts of the North of England.

Against using *mere colour*, however well defined, as a means of identifying strata at distant points, two circumstances are important. First, It is certain, in regard to sandstones especially, that the oxide of iron, to which the tint is generally owing, is a mere investment, a thin film which has been added by some accretionary process, round the small broken or rolled grains of generally clear quartz. Remove this film and the distinction is often impossible between tertiary, secondary, and primary grits.

Secondly, The colour which belongs to a remarkable group of strata (as old or new red sandstone, for example), and is even exclusively confined to that in a large given area, is found in other districts spreading into the conterminous strata both above and below. Thus, in the North of England, red sandstones and red clays interlaminate the lower beds of the mountain limestone, and are mixed with the upper beds of the coal measures. A remarkable instance has been carefully investigated by myself, in the north of Lancashire, where the colour of the new red sandstone passes downward through beds of the coal series (at Ingleton), and even beds of the millstone grit series (at Warton, Bentham, Heysham, &c.), so that in a tract of country between Lancaster and Garstang, the boundary of new red and millstone grit is not easily traceable. This circumstance is not observed farther south, but appears due to a specific action of long duration, centered in the northern part of Lancashire, and, perhaps, connected with the cause of the abundance of hæmatitic iron ore, in the limestone series of Furness and Egremont.

The *mineral aspect* of stratified rocks, is often more characteristic of age than their chemical composition. Conglomerates and laminar structures amidst the sandstones, peculiar concretionary arrangements amongst the limestones, and cleavage among the argillaceous rocks, may sometimes be appealed to with confidence to settle a disputed point of geological time. Thus studied, the sandstones of Devonshire resemble partly the flagstone or tilestone beds of the old red sandstone, and partly the arenaceous rocks which interlaminate the lower part of the mountain limestone series; but they hardly ever resemble the true conglomerate rocks of the old red, so much as the coarse, often red, 'grauwacke' of the Lammermuir and Cavan slate hills. The laminar structures of the argillaceous rocks are partly due to deposition and partly the result of cleavage; in these respects they exhibit all the usual varieties of old fine-grained slates. The limestones of the Devonian strata are much more allied by their lenticular, or irregularly expanded forms, abnormal occurrence, and occasional marmoroïd texture, to the calcareous beds mixed with the lowest mountain limestone shales, than to any of more recent date.

The *manner* in which the arenaceous, argillaceous, and calcareous terms are *combined,* in any series of strata, is often characteristic of geological age, especially if the series include many repetitions of such terms, and some of these are of peculiar composition. For example, in the full type of old red sandstone of Herefordshire,* we have conglomerate and laminar grits, red and mottled clays, red and mottled limestones ('cornstones'), and the arrangement is such, that after many repetitions, laminar grits ('tilestones') sometimes prevail near the bottom; limestones, buried in marls, occupy the middle zones, and conglomerates abound near the top. The tilestones are sometimes deficient, and cornstones or conglomerates, lie nearly at the very base of the section. The detached mass of red rocks, near Kirkby Lonsdale (not one-twentieth part of the thickness), contains, similarly, in the upper part conglomerates; in the lower part flaggy beds, perhaps representing the 'tilestone;' and in a few places we also see variously coloured and mottled marls in the middle. These circumstances are important for the identification of the age of that detached mass of red sandstone, for its relations by position to the limestone and to the slate are not very clear.

* *See* Murchison's Silurian Researches.

The Devonshire series, by consisting of groups of limestone, sandstone, and slate, or schist, may resemble any one of the great systems of rocks below the coal, but above the lowest clay-slates in which neither limestones nor arenaceous bands prevail. The limestone bands, in particular, are too numerous, and often too important, to allow of ranking the series of North or South Devon with the lowest stratified rocks of Wales or Cumberland; they permit closer comparisons with the strata of the 'Silurian,' 'old red,' and lower 'mountain limestone' groups, especially if we take, as an example of the latter, the section on the Lower Avon, near Bristol. The North Devon series, in particular, is very closely allied in aspect to the shales of the mountain limestone.

We have thus found by separate estimates, based on the chemical, mineral, and successional characters of rocks, probabilities of unequal value, but all tending one way, *viz.*, to fix the age of the older strata of Cornwall, Devon, and West Somerset, below the greater part of the mountain limestone, and above the lower slaty rocks of the North of England and Wales. Even if this conclusion had been indeterminate with only one order of evidence, it becomes admissible when all are sufficiently in agreement: but it does not appear possible, by these means, to arrive at a more definite classification.

If we ask, in the same spirit, whether any dependence is certainly proved between the *antiquity of the strata and the forms of plants and animal remains* which they contain, we receive a satisfactory answer. There is proved to be a real and constant dependence of this nature, such that in every large region yet studied, where fossils occur in strata of very unequal geological age, there are whole groups of organic forms which occur only in the oldest strata, others which prevail only in the middle, and some which are confined to the upper deposits.

If instead of classifying the strata by mineral or chemical analogies, we resolve to employ the characters furnished by successive combinations of organic life which have appeared and vanished on the land and in the sea, we shall obtain an arrangement of remarkable simplicity, more precise in application, and yet less disagreeably harsh in definition, than that which has been so long followed. We shall have three great systems of organic life, characterizable and recognizable by the prevalence of particular species, genera, families, and even orders and classes of animals and plants, but yet exhibiting, clearly and unequivocally, those *transitions* from one system of life to another, which ought to occur in every natural sequence of affinities, dependent on and coincident with a continuous succession of physical changes, which affected the atmosphere, the land, and the sea.

This view of the subject has been for some time gaining ground. That one great system of organic life belongs to the older, that is, in general terms, to the 'Primary' and 'Transition' strata, has been long known. Mr. Murchison, after adding immensely to the previous catalogues of these fossils, called the part of the series to which his attention was most directed 'Protozoic,' for which Professor Sedgwick proposed to substitute 'Palæozoic.' I have suggested* the propriety of extending the application of this term so as to make it include not only the 'Silurian' group, but all the newer types of organization up to the magnesian limestone; and following out this plan of nomenclature, have presented an outline of a general classification on the evidence of organic remains, which fortunately clashes very little with the ordinary scheme founded on structural, mineral, and chemical analogies of the rocks.

As this classification will be employed in some of the following pages, it is here offered in the original form :—

Proposed Titles depending on the Series of Organic Affinities.			Ordinary Title.
Cainozoic Strata	Upper	=	Pleiocene Tertiaries.
	Middle	=	Meiocene Tertiaries.
	Lower	=	Eocene Tertiaries.
Mesozoic Strata	Upper	=	Cretaceous System.
	Middle	=	Oolitic System.
	Lower	=	New Red formation.
Palæozoic Strata	Upper?	=	Magnesian Limestone formation. Carboniferous System.
	Middle?	=	(Eifel and South Devon.)
	Lower	=	Transition Strata. Primary Strata.

(The terms are founded on the verb ζαω or ζωω—to live, combined with καινος—recent, μεσος—medial or middle, and παλαιος—ancient.)

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* 'Penny Cyclopædia,' Articles GEOLOGY, PALÆOZOIC ROCKS, SALIFEROUS SYSTEM, &c.

Those who are familiar with the distribution of organic forms in the earth, will immediately perceive, that in the Palæozoic strata occur those which enclose the remarkable groups of Syringopora, Cyathocrinus, Leptæna, Bellerophon, Orthoceras, Palæoniscus; giving place in the Mesozoic strata to Apiocrinus, Clypeus, Plagiostoma, Gryphæa, Belemnites, Ammonites, Tetragonolepis, Plesiosaurus; and these in their turn vanish before the pulmoniferous and solenostomatous Gasteropoda, Argonauta, cycloid Fishes, Crocodiles proper, Cetacea, and Mammalia, which form the Cainozoic or recent (including the tertiary and existing) system of animal life.

Similarly, the combinations of fossil terrestrial plants are characteristic of three great periods:—to the Palæozoic strata belong Lepidodendron, Stigmaria, Sigillaria; the Mesozoic strata are rich in cycadeous and coniferous plants; while the Cainozoic rocks enclose a larger proportion of ordinary monocotyledonous and dicotyledonous plants.

These conclusions, however, must be considered as mainly founded on the progress of European geology, and the mind must be kept free to adopt such modifications as more extensive research may introduce hereafter, especially when, as Mr. De la Beche has suggested, the fossils of the tropical regions have been carefully compared with those of the now colder zones, since it by no means follows, that a law of affinities, applicable to regions which have been slowly and regularly cooled, should govern the series of life in areas which still retain conditions more nearly similar to those of ancient date.

The scale of strata, in almost every district, is found to be marked and symbolized in almost every part by some characteristic organic form, and still more perfectly by the concurrence of several such forms, belonging to different classes of animals or plants. In every such natural district, then, the organic remains alone, if preserved in abundance, are sufficient, independent of other aid, to determine the age of detached portions of the strata; but before we can venture to apply the rules found true in one district to the solution of problems in another, we must give them the most general form, that is to say, take into account all the known causes which add their influence to that of geological age in determining the aspect of organic life.

In existing nature, marine productions vary with the temperature of the sea, its depth, the nature of its bed, the direction of its currents, the character of its rivers, and other causes; and besides all these sources of local diversity in the same oceanic area, we find, on comparing distant parts of the ocean, and even gulfs and arms only partially disjoined, great and general diversity of the animal inhabitants.

Now we must allow that such causes, if they existed to the same extent in ancient nature, would produce corresponding effects. And though the earliest fossiliferous deposits may, from their great general analogy, be presumed to have been produced under more uniform conditions in distant localities than the rocks of later date, it is perfectly evident to those who have carefully studied ancient slates, that, in the accumulation of these, unequal depth of the sea, varying currents, and other things, exerted their influence. As a consequence, it follows that local variations in the types of organic life at the same epoch should appear. In fact they do appear, and one of the easiest of all the ways of proving and applying this truth, is to compare the fossils of calcareous, argillaceous, and arenaceous rocks of nearly the same age. The following differences will at once appear:—

In and near to the limestone beds marine organic remains are most abundant.

In the shales and grits almost exclusively (if at all), occur terrestrial or fluviatile exuviæ.

The Zoophytic tribes generally prevail in the limestones; but Crinoidal columns and Fenestellæ are often found in certain laminæ of the shales and grits.*

By a detailed analysis of the Molluscous and Crustaceous tribes, some further results would appear, but this would be at present unnecessary.

It is necessary to add another caution. When geologists say that one certain mass of strata is of the '*same age*' as another mass of strata, '*because it contains the same organic remains*,' they may be in danger of forgetting that this seemingly exact determination can only be certain if it rests on data which are assuredly exact, and sufficient, if not complete. Identity of species is sometimes beyond our power to ascertain, because we have in a fossil state only the conservable hard parts of Mollusca and Zoophyta, where the animals may have differed, without any difference being discoverable in the shells, *unless these could be seen in every period of growth.* Still more rare is the fact, that *all* the species in one locality *agree with all the species in another;* yet, geologists have sometimes ventured to trust the identification of even distantly situated strata, on the evidence of a *very small number* of coincident species. But besides this difficulty as regards the exactness and sufficiency of the data, there is another source of *indeterminateness* in the inference.

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* Mr. De la Beche has called attention to these important considerations, in the Report on the Geology of this district.

Taken without limitation, the proposition, that ' strata are of the same age because they contain the same organic remains,' assumes that the period of existence, on the land or in the sea, of the species which are thus treated, was exactly the same in all situations where they appeared.

This is not very probable, for in existing nature we find the distribution of species related to particular geographical centres, from which they may be supposed to have spread; and in a fossil state we find certain forms of life prevalent in one part of a group of strata in one district, but in a different part of the same in another. An example of this fact is afforded by a beautiful Orthis (*O. Hardrensis* of this work), which in Yorkshire lies *above*, and at Bristol lies *below* the great mass of mountain limestone.*

Taking all these circumstances into account, it is manifest that the utmost which can be inferred from an investigation of the organic remains in any mass of strata, unaided by other considerations, is an *approximation* to their geological antiquity; and this approximation will be subject to less and less chances of error, in proportion as the number and variety of the organic remains known in other allied districts and in the one under examination is great, and the distances between the localities compared small.

To render a comparison of the fossils of Devon and Cornwall with those of other districts successful in determining their relative antiquity, we must take care to choose those districts which contain nearly similar suites of rocks. For example, the fossiliferous rocks of Westmoreland are too little calcareous and arenaceous, the limestone rocks of Derbyshire and Mendip are too exclusively calcareous. We should take as our principal types such districts as the Hartz, the Rhine valley, the Ludlow district, the Usk district, Yorkshire, and Northumberland.

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* Mr. Austen has shewn the importance to Geology of a knowledge of the laws which govern the diffusion and distribution of living species, in communications to the British Association for the Advancement of Science.

Having selected the districts, and composed upon *one uniform plan* complete lists of the fossils known in each region; three forms of comparison may be followed, each yielding a precise numerical expression of the analogy existing between every two.

1. We may compare the total number of species found in each region.

2. The number of species in each class, family, or smaller group, in each district.

3. The number of species identical, or closely allied, in every two districts.

A word on the composition of the lists which appear in this volume.

I have described nothing which I have not seen, and have omitted nothing which I have examined sufficiently. I think it certain, that as far as numbers go, the catalogue is nearly complete under these conditions. On considering the principles which generally regulate the determination of species and assignment of names, in geological works of repute, I find the following rules to be almost universal.

Forms which, by intervening variations, or probable changes with age, can be safely referred to one general type, receive one specific name.

Forms which, by more than one character, appear to differ both in youth and age, receive distinct names.

Forms which are different in even one character, provided it be of general importance in structure, are distinguished by name.

The value of all determinations in conformity with these rules, is in the direct ratio of the number of specimens examined, and their state of perfection.

If these principles are strictly followed, much of the confusion which has grown up around the study of Palæontology will disappear. We shall know what forms are variable (as Terebratula), what are more constant (as Trigonia), and apply suitable caution to each case. Without now stopping to inquire how far this has been attended to in the present case, or in other works, it is sufficient for the present reasoning, to observe that in the main the analytical tendencies of those writers who have published most largely on the Palæozoic fossils, with which we have to compare extinct Devonian forms, are nearly equal. Of this I adduce, as examples, Sowerby's 'Mineral Conchology of Great Britain,' Mr. Murchison's 'Silurian Researches,' and my own work on 'Mountain Limestone.' I may also mention that my present catalogues were in a great measure completed before the appearance of Mr. Sowerby's figures and descriptions in the Geol. Trans., and that on receiving the volume containing the labours in this field of Lonsdale and Sowerby, almost the only difference in any part of the catalogues was in the different names given to the same new species, which were equally distinguished from known species by all the observers.

To save confusion, I have in every instance abandoned my own MS. name, and adopted that already published, whether in Britain or on the Continent, so far as I have become aware of them.

The catalogues of Palæozoic fossils in Britain, then, being in this respect comparable, the numerical results are free from any strong objection on the score of unequal analytical tendencies in those who framed them, and may be trusted for *proportions* where the *absolute numbers* are not too small.

In the case before us it will be sufficient to take only two terms of comparison with the Devonshire strata, *viz.*, Mr. Murchison's catalogue of Silurian fossils (which I call Lower Palæozoic Fossils);* and my own list of fossils of the mountain limestone (which are here called Upper Palæozoic Fossils).†

The results of a general numerical comparison of marine invertebral races, are as under:—

Lower Palæozoic Fossils.	Devon and Cornwall.	Upper Palæozoic Fossils.
336	275	420

Generally speaking, it is shewn ‡ that the relative abundance of species of organic remains, when compared to given thicknesses of strata, is least among the oldest strata, and the result of the comparison just presented would be to place the Devonian rocks lower in the series than those assumed to be lowest, but for the fact that the catalogue of fossils drawn up by Murchison is formed from the district which is by far the richest known. The same rocks in Westmoreland have not yielded above one-third of the number. Moreover, there is a considerable number of species found in Devonshire which have not come under my observation; and many, I feel quite satisfied, remain to be discovered.

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* There are very few peculiar species known below the rocks described by Mr. Murchison.

† The general character of mountain limestone fossils is continued upwards into the magnesian limestone.

‡ Guide to Geology, 3rd edition, p. 68.

The *proportionate numbers* of the species ranked in the several classes and great divisions, afford much more valuable data for reasoning. The following tables give, first, the absolute numbers; secondly, the proportion to 1000, according to the plan which I have sometime since exemplified in the 'Encyclopædia Metropolitana.'

TABLE I.

Shewing the Number of Species of the several Classes of Fossils.

	Lower Palæozoic.	Devon and Cornwall.	Upper Palæozoic.
Polypiaria	65	34	41
Echinodermata	14	16	43
Conchifera Plagimyona	21	26	32
,, Mesomyona	6	20	24
,, Brachiopoda	107	83	100
Mollusca Gasteropoda	34	36	91
,, Cephalopoda Monothalamacea	11	7	10
,, ,, Polythalamacea	41	44	69
,, Crustacea	37	9	10
	336	275	420

Considering the inferiority of the total number of the Devon and Cornwall fossils, it is remarkable that in regard to *Conchifera Plagimyona* and *Mesomyona* the series is richer than the Lower Palæozoic strata. The next table is however more convenient for such comparisons.

TABLE II.

Proportion to 1000 *of the Number of Species of Fossils in the several Classes.*

	Lower Palæozoic.	Devon and Cornwall.	Upper Palæozoic.
Polypiaria	193	124*	97
Echinodermata	42	58*	102
Conchifera Plagimyona	62	95†	76
,, Mesomyona	18	73†	57
,, Brachiopoda	319	302*	238
Mollusca Gasteropoda	101	131*	217
,, Cephalopoda Monothalamacea	33	25*	24
,, ,, Polythalamacea	122	160*	164
Crustacea	110	33*	24

In this table we may observe that the number for Devonshire fossils is intermediate between those for the Lower and Upper Palæozoic fossils . . . . . seven times, marked by *
Greater than either . . . . twice.
Less than either . . . . . 0.

The sum of the differences + and — between the Upper and Lower Palæozoic lists, is 543
between the Lower Palæozoic and the Devon list, 343
between the Upper Palæozoic and the Devon list, 270

Hence it appears, that in respect of the general character of marine invertebral life, the proportions of the Devon fossils shew them to have nearly equal affinity to the Upper and to the Lower Palæozoic series; and a much greater affinity to each and either of these, than those extreme terms have for each other.

If we separate the table in two parts, by a line between the *Conchifera Brachiopoda* and the *Gasteropoda,* we find—

The sum of the differences in the upper part of the table:—
Between Lower and Upper Palæozoic . . 290
„ Lower Palæozoic and Devon . . 190
„ Upper Palæozoic and Devon . . 170

The sum of the differences in the lower part of the table:—
Between Lower and Upper Palæozoic . . 253
„ Lower Palæozoic and Devon . . 153
„ Upper Palæozoic and Devon . . 100

Reducing the last to the same proportions as the other, we have the combined results thus:—

Between	Zoophyta and Conchifera.	Mollusca, Cephalopoda, &c.
Lower and Upper Palæozoic	290	290
Lower Palæozoic and Devon	190	175
Upper Palæozoic and Devon	170	115

In order to shew the degree of confidence which may be placed in the result thus obtained, I add a table on the same plan, and confined to the same natural groups of fossils, but embracing the Oolitic system of strata, and omitting the Devon and Cornwall fossils.

TABLE III.

	Lower Palæozoic.	Upper Palæozoic.	Mesozoic.
Polypiaria	193	97	169
Echinodermata	42	102	89
Plagimyona	62	76	177
Mesomyona	18	57	126
Brachiopoda	319	238	57
Gasteropoda	101	217	107
Monothalamacea	33	24	
Polythalamacea	122	164	255
Crustacea	110	24	21

Here will be seen, in the oolites, the augmentation of the Plagimyona and Mesomyona, and the diminution of the enormous proportion of Brachiopoda which characterises the older strata: the Monothalamacea are extinct, while the Polythalamacea have become even more numerous: the Crustacea are also fewer in proportion. In this respect, the oldest system of strata is by far the most conspicuous.

The sum of the differences + and — between the
Lower Palæozoic and the Mesozoic lists, is 817
Lower Palæozoic and Upper Palæozoic . 543
Upper Palæozoic and Mesozoic 664

Such being the numerical results of comparisons between the fossils of Devon and Cornwall, taken in one mass, and those of other districts, we must proceed to compare upon the same principles the fossils of those parts of Devon and Cornwall which have yielded fossils in greatest abundance from limited thicknesses of strata. These are three; *viz.*, the fossiliferous ranges of Pilton and Croyde, forming the upper series in North Devon (below the carbonaceous group); the fossiliferous ranges of South Devon; and the district of North Cornwall, including Petherwin and Tintagel.

Table IV.

Of the Number of Species in the several Classes in the three Districts.

	South Devon.	North Cornwall.	Upper North Devon.
Polypiaria	28	5	7
Echinodermata	9	2	6
Conchifera Plagimyona	7	6	13
,, Mesomyona	6	7	4
,, Brachiopoda	55	18	22
Gasteropoda	27	9	10
Cephalopoda Monothalamacea	4	2	3
,, Polythalamacea	21	17	5
Crustacea	9	1	2
	166	67	72

Table V.

Of the Proportion to 1000 of the Species in the several Classes and Districts.

	South Devon.	North Cornwall.	Upper North Devon.
Polypiaria	169	77	97
Echinodermata	54	31	83
Conchifera Plagimyona	42	92	180
,, Mesomyona	36	108	56
,, Brachiopoda	331	246	306
Gasteropoda	163	138	139
Cephalopoda Monothalamacea	24	31	42
,, Polythalamacea	127	261	69
Crustacea	54	16	28

From this table we collect—

The sum of the differences between the numbers (+ and —)
For South Devon and North Cornwall groups = 526
South Devon and Upper North Devon groups = 410
Upper North Devon and North Cornwall groups = 488

So that between almost adjacent districts and strata, not known to be of different geological age, we find numerical differences in the analogies in one case nearly as great as between the Upper and Lower Palæozoic groups, and in the others greater than the differences of the whole Devon series from the Lower and Upper series of Palæozoic species. This may depend on local conditions—as the greater or less prevalence of limestone—and other circumstances.

The principal peculiarities of the Petherwin series of fossils appear to be an excess of Polythalamacea, and a diminution of Brachiopoda: the South Devon series is richest in corals; the Pilton group in Plagimyona. In Gasteropoda all the groups agree.

To complete the subject it will be proper to confront with this result the relations of these three districts, taken singly, to the Lower and Upper Palæozoic fossils, though in this comparison the influence of peculiar local conditions is likely to be so great as to conceal the dependence on mere sequence of time, which is the thing sought for.

TABLE VI.

Species in 1000 *of the several Classes of Fossils in the Lower Palæozoic, South Devon, Upper North Devon, North Cornwall, and Upper Palæozoic Strata.*

	Lower Palæozoic.	South Devon.	North Cornwall.	Upper North Devon.	Upper Palæozoic.
Polypiaria	193	169	77	97	97
Echinodermata	42	54	31	83	102
Conchifera Plagimyona . .	62	42	92	180	76
,, Mesomyona . .	18	36	108	56	57
,, Brachiopoda . .	319	331	246	306	237
Gasteropoda	101	163	138	139	217
Cephalopoda Monothalamacea	33	24	31	42	24
,, Polythalamacea	122	127	261	62	164
Crustacea . . . . . . ,	110	54	16	28	24

Sum of the differences of Lower and Upper Palæozoic fossils,
as before 543
Lower Palæozoic and South Devon 221
„ and North Cornwall 585
„ and Upper North Devon . . 483
Upper Palæozoic and South Devon 390
„ and North Cornwall . . . 358
„ and Upper North Devon . . 388

REMARKS ON TABLE VI.

The result arrived at in this Table is to establish, with as much security as the method of numerical estimation under the circumstances allows, a much greater affinity between the North Cornwall and Upper North Devon groups and the upper members of the Palæozoic period, than with the lower, and a much greater approach of the South Devon group to the older Palæozoic periods, than to the upper. The conclusion before arrived at, of the order of affinity of the several groups, is here confirmed, and we may now represent the final result of this part of the investigation thus:—

Later Palæozoic period.
North Cornish period.
Later North Devon period (anterior to the carbonaceous group.)
South Devon period.
Earlier Palæozoic period.

This conclusion is independent of inaccuracy in the determination of specific characters; it only assumes the number of species to be proportionally known, and their right place in the several classes determined; but it is liable to an irremovable doubt as to the degree in which the differences depend on mere local circumstances rather than on sequence of time, which for the sake of the illustration is assumed to be the governing element.

If we assume, further, the intervals of *time* elapsed between the mean epoch of each of the several groups of fossils to be proportioned to the numerical differences in their proportions above traced, and form a scale accordingly, the mean places of the groups will be thus represented, *by combining all the differences between the several terms.*

Upper Palæozoic.
Interval, 316.
North Cornwall.
Interval, 132.
Upper North Devon.
Interval, 264.
South Devon.
Interval, 374.
Lower Palæozoic.

Now supposing this view to be correct, the following among other consequences should follow, that if any positively known fossils of the Lower Palæozoic strata should be found in either of these three groups of Cornwall and Devon, they should be found most plentifully in the group of South Devon; and on the other hand, characteristic forms of the Upper Palæozoic rocks should be looked for in the districts of North Cornwall and North Devon.

This is but imperfectly borne out by the facts. In South Devon, indeed, occurs *Atrypa prisca,* with a considerable proportion of corals identical with species common in the Lower Palæozoic rocks, while in North Devon and Cornwall, the analogues of *Spirifera attenuata* and *Leptæna scabricula* are plentiful; but in respect of the Brachiopoda generally, South Devon presents a very positive analogy to the Upper Palæozoic strata. Perhaps its affinity to the Upper and Lower Palæozoic strata depends on the same cause, the predominance of limestone fossils.

The analogy of the Lower North Devon series (Linton and Ilfracombe groups) to the South Devon strata is obvious; since of 23 species mentioned in these groups in the Synoptic Table, 15 occur in the South Devon series.

To complete this discussion, it only remains to estimate the degree in which the lists of Lower and Upper Palæozoic fossils ought to be taken as sufficiently characteristic of these geological periods respectively. It is probable that of these lists, that for the Upper Palæozoic rocks, though including the greatest number of forms, is the least complete. In fact, it is chiefly from the limestones of that series, that the species have been largely and diligently collected, and neither the shales above nor those below the great mass of the limestone have been fully examined. Perhaps, and probably (if we may judge from the banks of the Avon and the Yoredale rocks of the North of England), these shales may hereafter yield forms more comparable with the fossils of North Devon and Cornwall, than have yet been found, and thus strengthen the impression derived from the mineral aspect and succession of these argillaceous rocks, that their principal analogy is to the lowest shales of the mountain limestone series. If so, the non-fossiliferous red sandstones which overlie the limestones of South Devon and Ilfracombe may specially claim affinity to some portion of the old red sandstone, and these limestones, joined to those of the Eifel, will justly constitute a new and middle term of the Palæozoic series.

We may now change the basis of our reasoning, and introduce precise specific determinations of the fossils, to make a new series of comparisons—first, between the Devonshire strata generally, and those of the Upper and Lower Palæozoic strata; secondly, between the three divisions of the Devon and Cornish strata.

Catalogue of Species of Invertebrata which occur in Devon and Cornwall, and also in Lower Palæozoic and Upper Palæozoic strata.

[The * marks the occurrence of the species.]

	L.P.	U.P.
Turbinolopsis celtica	*	
,, bina	*	
Amplexus tortuosus		*
Cyathophyllum turbinatum	*	
,, cæspitosum	*	
Porites pyriformis	*	
Favosites polymorpha	*	
,, Gottlandica	*	
,, spongites	*	
,, fibrosa	*	
Stromatopora concentrica	*	
Fenestella laxa		*
Platycrinus tuberculatus		*
,, pentangularis		*
Actinocrinus 30-dactylus		*
Cyathocrinus megastylus		*
Pleurorhynchus minax		*
,, aliformis		*
Sanguinolaria sulcata	*	
Pullastra complanata	*	
Cypricardia impressa	*	
,, semisulcata	*	
Nucula ovata	*	
Posidonia tuberculata		*
Pecten plicatus		*
Leptæna analoga		*
,, scabricula		*
,, laxispina		*
,, mesoloba		*
Orthis compressa	*	
,, Hardrensis		*
,, semicircularis	*	
,, crenistria		*
,, arachnoidea		*
,, resupinata		*
Spirifera oblata		*
,, lineata		*
,, cuspidata		*

	L.P.	U.P.
Spirifera distans		*
,, ostiolata		*
,, rotundata		*
Terebratula prisca	*	
,, pleurodon		*
,, pugnus		*
,, reniformis		*
,, rhomboidea		*
,, acuminata		*
sacculus		*
,, hastata ?		*
Acroculia vetusta	*	*
Pleurotomaria monilifera		*
,, expansa		*
Loxonema sinuosa	*	
,, tumida		*
,, rugifera		*
Murchisonia angulata		*
Macrocheilus imbricatus		*
,, acutus		*
Bellerophon Urii		*
,, trilobatus	*	
,, Woodwardii		*
,, globatus	*	
,, Wenlockensis	*	
,, hiulcus		*
Orthoceras cinctum		*
,, Ludense	*	
,, laterale		*
,, ibex	*	
,, lineolatum		*
Goniatites spiralis		*
,, crenistria		*
,, mixolobus		*
,, spirorbis		*
,, serpentinus		*
Asaphus granuliferus		*
Homalonotus	*	

TABLE VII.

	Number of Species in Devon and Cornwall.	Also found in Lower Palæozoic.	Also found in Upper Palæozoic.	Eifel and Bensberg.
Polypiaria	34	10	2	16
Echinodermata	16	0	4	4
Conchifera Plagimyona	26	4	2	2
,, Mesomyona	20	0	2	2
,, Brachiopoda	83	3	21	22
Gasteropoda	36	2	8	4
Cephalopoda Monothalamacea	7	3	3	1
,, Polythalamacea	44	2	8	3
Crustacea	9	1	1	3
	275	25	51	57

Table VII. shews the number of species of invertebrate fossils in Devonshire and Cornwall which are also found in the Lower or Upper Palæozoic strata, or in the Eifel, according to Goldfuss and my own notes, there being probably several more.

Having arranged the preceding Tables, and numerical results, founded on the data of the general Synopsis given previously, I turned to examine how far they were in accordance with the views of Mr. Lonsdale on the same subject, as regards South Devon, given in the Geol. Trans., 2nd Series, vol. v., p. 721, et seq.; and the general catalogue of Murchison and Sedgwick, p. 703. What is already inferred, depends on data which have passed my own scrutiny, and been admitted positively, or conditionally, as expressed in regard to each species. In the tables referred to, several other species are mentioned on the competent authority of Lonsdale, Sowerby, and Austen, as occurring in the district we have been surveying. The greater part of these I have either not seen at all, or so insufficiently, that figures of them could not be introduced. Regarding a few species, there is probably a difference of nomenclature. The following is a general list of all these species, with references to figures:—

	In which of the Lists.	Reference to Figures.	Locality.
POLYPIARIA.			
Scyphia turbinata (x), Goldfuss .	Lonsdale . . .	G. T. pl. 58, fig. 9 .	Plymouth.
—			
CRINOIDEA.			
Cupressocrinites (x), Goldfuss. .	Murch. and Sedg.	. .	Ditto.
—			
CONCHIFERA PLAGIMYONA.			
Corbula Hennahii, Sowerby . .	Ditto . . .	G. T. pl. 56, fig. 1 .	Ditto.
—			
CONCHIFERA MESOMYONA.			
Pecten nexilis, Sowerby . . .	Murch. and Sedg.	G. T. pl. 53, fig. 1, 2	Barnstaple.
,, arenosus (u), Phillips . .	Ditto . . .	Geol. Yorkshire .	Ditto.
Avicula pectinoides, Sowerby . .	Ditto . . .	G. T. tab. 54, fig. 2	Barustaple.
—			
CONCHIFERA BRACHIOPODA.			
Leptæna prælonga, Sowerby . .	Ditto . . .	G. T. tab. 53, fig. 29	Croyde Bay.
,, interrupta, ,, . .	Ditto . . .	G. T. tab. 56, fig. 7	Plymouth.
Orthis tenuistriata, Sowerby . .	Murch. and Sedg.	G. T. tab. 57, fig. 11	Morebath.
Spirifera affinis, ,, . .	Ditto . . .	G. T. tab. 57, fig. 11	Plymouth.
,, inornata ,, . .	Ditto . . .	G. T. tab. 53, fig. 9	Ilfracombe.

	In which of the Lists.	Reference to Figures.	Locality.
CONCHIFERA BRACHIOPODA—*continued.*			
Spirifera trapezoidalis (L), Dalman	Both Lists . .	Sil. Res. tab. 5, fig. 14	Newton Bushel.
,, extensa, Sowerby . .	Murch. and Sedg.	G. T. tab. 54, fig. 11	Barnstaple, Saunton, Petherwin.
,, pulchella, Sowerby . .	Murch. and Sedg.	G. T. tab. 57, fig. 9	Plymouth.
Terebratula concentrica (E), V. Buch	Both Lists . .		
,, oblonga, Sowerby. .	Murch. and Sedg.	G. T. tab. 53, fig. 6	Barnstaple.
,, hispida ,, . .	,,	G. T. tab. 54, fig. 4	Petherwiu.
,, indentata ,, . .	,,	G. T. tab. 54, fig. 6	Ditto, Barnstaple.
,, triangularis ,, . .	,,	G. T. tab. 54, fig. 9	Petherwin.
,, striatula ,, . .	,,	G. T. tab, 54, fig. 10	Ditto.
,, flexistria (U), Phillips	Lonsdale . . .	Geol. Yorkshire .	Newton Bushel.
,, triloba, Sowerby . .	Murch. and Sedg.	G. T. tab. 56, fig. 14	Plymouth, Newton.
,, Wilsoni ? (L) . . .	Lonsdale . . .	Sil. Res. tab. 6, fig. 7	Ditto.
,, protracta, Sowerby .	Murch. and Sedg.	G. T. tab. 56, fig. 16	Plymouth.
,, mantiæ (U) ,, .	Lonsdale . . .	Min. Conch. tab. 277, fig. 1.	Ditto, Newton.
,, latissima ,, .	Murch. and Sedg.	G. T. tab. 56, fig. 25	Plymouth.
,, fallax (U) ,, .	Ditto . . .	G. T. tab. 54, fig. 15	Petherwin and Barnstaple.
,, impleta ,, .	Ditto . . .	G. T. tab. 57, fig. 2	Plymouth.
,, sphærica (L) ,, .	Ditto . . .	G. T. tab. 57, fig. 3	Ditto.
,, implexa ,, .	Murch. and Sedg.	G. T. tab. 57, fig. 4	Ditto.
,, borealis (E), Schlott.	Lonsdale . . .	Schlott. tab. 20, fig. 6	Newtou, Ogwell, Plymouth.
GASTEROPODA.			
Trochus Boueii (E), Steininger. .	Both Lists . .	Geol. Soc. France, tom. 1, tab. 23, fig. 4.	Near Newton Bushel.
Natica deformis, Sowerby . . .	Murch. and Sedg.	G. T. tab. 57, fig. 14	Plymouth.
,, speciosa ,, . . .	Ditto . . .	G. T. tab. 57, fig. 15	Ditto.
Turbo subangulatus ,, . . .	Ditto . . .	G. T. tab. 57, fig. 18	Ditto.
,, cirriformis ,, . . .	Ditto . . .	G. T. tab. 57, fig. 19, 20.	Ditto.
Pleurotomaria cirriformis (E), Sow.	Ditto . . .	G. T. tab. 57, fig. 17	Ditto.
CEPHALOPODA.			
Orthoceras cylindraceum, Sowerby	Murch. and Sedg.	G. T. tab. 57, fig. 28	Newton Bushel.
Goniatites viuctus, Sowerby . .	Ditto . . .	G. T. tab. 54, fig. 18	Culm limestone, near Barnstaple, also at Petherwin.
,, carbonarius ,, . .	Ditto . . .	G. T. tab. 52, fig. 8, 9	Near Barnstaple.

Note.—Atrypa aspera of Mr. Lonsdale's List, and *A. squamosu* of Murchison and Sedgwick's, are the same.

Leptæna reticulata and *Spirifera crenistria,* of the two Lists, are the same shell.

These lists contain 39 species, and notice of one not named specifically, making altogether 40 species, of which the names do not occur in my lists as having been sufficiently examined by me.

Of these—

6, *viz.—Scyphia turbinata, Cupressocrinites, Terebratula concentrica, Terebratula borealis, Trochus Boueii, Pleurotomaria cirriformis*—occur also in the Eifel or at Bensberg, and are marked (E.)

3, *viz.*—*Spirifera* (*Cyrtia*, Dalman) *trapezoidalis*, *Spirifera cassidea*, *Terebratula Wilsoni*, *T. sphærica*—occur in the Lower Palæozoic (Silurian) region, and are marked (L.)

4, *viz.*—*Pecten plicatus*, *Pecten arenosus*, *Terebratula flexistria*, *Terebr. Mantiæ*, *Terebr. fallax*—occur in the Upper Palæozoic (mountain limestone) and are marked (U.)

Shewing very nearly the same relative analogies of Devon and Cornwall fossils to the three types selected for comparison, though founded on different data. Adding them together, we have, as the most probable general result of the whole investigation, specific analogy of the Devon and Cornwall fossils :—

To the Upper Palæozoic series . . .	55
To the Eifel and Bensberg series . .	63
To the Lower Palæozoic series . . .	28

Such being the general result of this kind of comparison of the Devonian with three of the best known groups of Palæozoic fossils, let us further analyze the subject by introducing a similar comparison to those three groups for each of the three districts of Devon and Cornwall. The following Table gives this view (introducing only the species mentioned in the Synoptic Table.)

TABLE VIII.

	In South Devon, and also in			In Upper North Devon, and also in			In North Cornwall, and also in		
	L. P.	E.	U. P.	L. P.	E.	U. P.	L. P.	E.	U. P.
Polypiaria	9	15	2	1	1	1	2	1	2
Crinoidea	0	3	4	0	2	0	0	0	0
Plagimyona	1	3	2	3	0	0	3	0	0
Mesomyona	0	1	1	0	1	1	0	1	0
Brachiopoda	2	18	14	2	2	3	0	1	3
Gasteropoda	2	5	4	1	0	4	1	0	2
Monothalamacea . . .	2	1	1	2	0	1	1	0	1
Polythalamacea	0	2	3	1	0	1	2	1	2
Crustacea	1	3	1	0	1	0	0	0	0
Sums . . .	17	51	32	10	7	11	9	4	10

These sums being reduced to one proportion, by making the total number of fossils in each of the three districts of Devon and Cornwall 1000, become,—

TABLE IX.

In South Devon, and also in			In Upper North Devon, and also in			In North Cornwall, and also in		
L. P.	E.	U. P.	L. P.	E.	U. P.	L. P.	E.	U. P.
162	307	209	139	97	153	138	62	154

Shewing that the district of Devon and Cornwall, in which the most positive analogy is clearly traceable with the calcareous Eifel region, is that of the Torbay and Plymouth calcareous district.

We may next examine the distribution of those species which occur in more than one of the three districts already defined, by help of the following catalogue.

Catalogue of Species which occur in more than one of the three Districts, viz., South Devon, North Cornwall, and Upper and Lower North Devon, (excluding from each the carbonaceous deposits.)

[The * indicates the occurrence of the species.]

Names of Species.	S. Devon.	N. Cornwall.	N. Devon.	Names of Species.	S. Devon.	N. Cornwall.	N. Devon.
Turbinolopsis celtica . .	*	*	*	Orthis parallela . . .		*	*
,, pluriradialis	*		*	,, granulosa . . .	*		*
Amplexus tortuosus . .	*	*		,, compressa . . .	*		*
Cyathophyllum cæspitosum	*	*	*	Spirifera microgemma .	*		*
Cystiphyllum Damnoniense	*		*	,, unguiculus . .	*	*	*
Strombodes vermicularis .	*		*?	,, decussata . . .		*	*
Favosites polymorpha . .	*		*	,, calcarata . . .		*	*
,, fibrosa	*		*	,, disjuncta . . .	*	*	*
Millepora similis . . .	*		*	Strigocephalus Burtini .	*		*
Fenestella laxa . . .	*	*	*	Terebratula desquamata .	*	*	
,, antiqua . . .	*	*	*	,, pleurodon .		*	*
,, arthritica . .	*		*	Acroculia vetusta . . .	*		*
Cyathocrinus pinnatus .	*		*	Euomphalus serpens . .	*	*	*
,, variabilis. .		*	*	Pleurotomaria cancellata .	*	*	*
Actinocrinus tenuistriatus .		*	*	,, aspera . .	*	*	*
Cypricardia impressa . .		*	*	Murchisonia angulata . .		*	*
Nucula ovata	*		*	Loxonema nexilis . . .	*	*	
Pecten transversus . .		*	*	Bellerophon trilobatus .	*	*	*
,, polytrichus . .	*		*	Orthoceras laterale. . .	*	*	
Leptæna caperata . . .		*	*	,, cinctum . . .	*	*	
,, fragaria . . .	*	*		,, Ludense . .		*	*
,, membranacea .		*	*	,, tentaculare . .	*		*
Orthis sordida	*		*	Calymene granulata . .	*	*	
,, interlineata . . .	*	*	*	,, Latreillii . .	*		*
,, plicata	*		*	,, lævis . . .	*		*

TABLE X.

SPECIES WHICH OCCUR			
In South Devon and North Cornwall	18	In North Cornwall and North Devon	23
,, and North Devon	27	,, and Lower N. Devon	6
,, and Lower N. Devon	15	,, and Upper N. Devon	21
,, and Upper N. Devon	20	In S. Devon, N. Cornwall & N. Devon	11

REMARKS ON TABLE X.

The chances of occurrence of identical species at different localities in the same range of strata are much less than is commonly imagined, and in a considerable degree depend on the earnestness and completeness of the search. Let us imagine two districts in which the same, and only the same species really occur, but unequally distributed in the different strata. Further, let it be supposed that all these strata are exposed in quarries or other open places, so that they are equally searched on the average in each tract. Let the number of fossil species really occurring *in each*, be N, and the number found *in each* n. It is obvious that the chance of discovering identical forms in both increases as the number found (n) approaches to N, (or $\frac{n}{N}$ approaches to 1), and diminishes as the fraction $\frac{n}{N}$ approaches to 0. Suppose N, in the case of the Devonian strata, to be 500, and that *in each* of the districts n was equal to 166 (the number of invertebrata admitted in the synopsis for South Devon), the chance of finding *a second time* any unselected one of the 166 found once, $= \frac{166}{500}$, and the probable number of identical forms among 166 found would be 54. If we assume in regard to the Eifel fossils, that about such a number as 166 is known—(Steininger gives not half as many), and that the accordances already found with the South Devon fossils be 57 (page 173), and that every species is identical at the two places, the whole number of the species (N) would be $\frac{166^2}{57} = 483$.

We have at present no means of ascertaining the truth of the assumptions on which this depends; but two things are plain from this simple calculation.

1. That the accordance of the Eifel and South Devon districts,

if judged of by specific analogies, is as great as any facts known in geology could justify us in expecting of strata presumed to be absolutely identical in geological age, *and equally productive of fossils.*

2. That whenever as many as about one-third proportion of the species found at *two equally productive* places is identical, this is strong evidence of the very close affinity of the systems of marine invertebral life there fossilized.

But the strata at different, and especially distant points, are—

1. Unequally productive of fossils *in a given space of ground.*
2. Diversified by local concentrations of families.
3. Unequally explored.

And all these circumstances diminish still farther the chance of finding identical species. The first and the last of these diminishing causes appear in the resulting numbers of species collected, the other can only be estimated approximately. Omitting it, we see clearly that the chance of finding identical forms at two places, out of 500 species really occurring, but of which 166 have been found in one place and 67 in another (p. 169), is $\frac{67 \times 166}{500} = 22 \cdot 25$, and if 72 be found at one place and 166 at another, the chance is, that $\frac{72 \times 166}{500} = 23 \cdot 9$ will be met with.

The numbers actually occurring, as given in the table, are,—

20, instead of 23·9, between South and Upper North Devon.
18 ,, 22·5 ,, South Devon and North Cornwall.

Again, on the same supposition of 500 species really occurring, but only 67 found in North Cornwall and 72 in Upper North Devon, we have chance of identical forms $= \frac{67 \times 72}{500} = 9 \cdot 6$, yet the number really occurring identical appears to be 21, which would imply that the total number of species in these two districts supposing them all identical), is about 250, and prove a determinate affinity between them.

A specific analogy can, in the same manner, be proved between the calcareous slaty series of Petherwin and the 'Clymenien-kalk,' as Count Munster calls the limestone of Schubelhammer, &c. on the flanks of the Fichtelgebirge. In the general list we find a Conchifer, probably a Brachiopod, two Gasteropoda, two Goniatites, three Clymeniæ, and one Crustacean, among the characteristic and common fossils of Petherwin also occurring in the Fichtelgebirge, chiefly at Schubelhammer.

Similarly, if we take into account only the fossils of the upper or carbonaceous series of Devonshire, we find the few shells yet obtained from that group mostly referrible to species known in the mountain limestone series elsewhere :—

Pleurorhynchus minax.
Posidonia tuberculata.
Leptæna mesoloba.
Goniatites spiralis.
" *crenistria.*
" *mixolobus.*
" *spirorbis.*
" *serpentinus.*

Eight species, among so few, afford very good evidence on this point.

Only at one of the localities included in this series (Combe, near Ashburton) is the evidence equivocal. There the most remarkable forms are such as to point to another parallel. *Turbinolopsis bina, T. celtica,* and small Orthides, like *O. interlineata,* and *O. flabellulum,* would appear to shew it to be of date corresponding perhaps to the shales, &c. of Mudstone Bay. As to mineral substance, it is certainly like part of the carbonaceous series of Coddon Hill, and is associated with gritty rocks like those of Chudleigh, and yet appears to dip under the Ashburton limestone.

Another locality associated with the Petherwin group deserves attention. This is Yealm Bridge, north of Launceston, and consequently included within the carbonaceous area. Yet by its fossils, *Turbinolopsis pluriradialis,* Bellerophontes, &c., it seems to be of another age altogether, and is perhaps to be ranked with strata altogether below the carbonaceous series.

The frequent occurrence of the name of Elbersreuth, and Schubelhammer, among the foreign localities of the Devonian shells, makes it necessary to refer to the general view of the fossils at these two localities given in the 'Beïtrage' of Munster and Von Meyer, 1840. The Elbersreuth limestone is full of Orthocerata, that of Schubelhammer rich in Clymeniæ.

The following is a summary comparison of the fossil treasures of these localities, upon the same plan as that used for the Devonian series :—

TABLE XI.

Number of Species.	Large Groups.	Occurrence in		In both the Rocks.
		Orthoceratiten Kalk of Elbersreuth.	Clymenien Kalk of Schubelhammer.	
2	Polypiaria	..	2	..
8	Crinoidea	2	6	..
77	Plagimyona	43	33	1 ?
21	Mesomyona	..	21	..
16	Brachiopoda	8	8	..
42	Gasteropoda*	25	13	4
2	Monothalamacea	2	..	..
121	Polythalamacea	20	99	2
28	Crustacea	21	7	..
2	Annelida	2	..	..
319		123	189	7

On this result the author remarks that the two limestones thus compared and contrasted are quite distinct in geological age and position. The Elbersreuth limestone is considered the upper of the two. It is deficient of Clymeniæ and Goniatites, while that of Schubelhammer, &c. abounds in them.

Trilobites, Cardiacea, and Trachelipoda, are more common in the Elbersreuth limestone than in that of Schubelhammer, &c.

Monomyaria (Mesomyona) are rare in the Elbersreuth limestone, but plentiful in the other. A generic group of *Lunula-cardium* belongs to the lower limestone which, besides the typical locality in the Fichtelgebirge, is found in Russia, Waldeck, Silesia, &c.

Among the 319 species above tabulated, not one mountain limestone fossil, none of the peculiar fishes of the old red sandstone, occur, nor had the author become aware of any identical shells from the Devon and Cornwall district. He considers, however, out of the 319 species, 23 to be identical with specimens from the Silurian series, mostly from the upper part of that series, of which eight occur in the Clymenien-kalk, and 15 in the Orthoceratiten-kalk, and concludes that both these limestones should be ranked between the 'Cambrian' and 'Silurian' series as a peculiar group. This conclusion is partly founded on the *supposition* that the English Clymeniæ belong to the 'Cambrian' rocks, which is not the case.

---

* This includes Petraia (?), 5 species said to be described in tab. 3 of a previous memoir.

The Orthocerata of the Elbersreuth limestone have all a discontinuous siphon, which Munster thinks a mark of high geological antiquity.

Seven species in common, out of a total of 319, is a very small proportion; even between the Petherwin beds and the Clymenienkalk we have 10 accordances out of a total of (123 + 67) = 190 species; and between the Elbersreuth limestone and the South Devon shells there already appear at least five or six identical out of (189 + 166) = 355. The total absence of fishes from the limestones mentioned by Munster offers a singular general analogy with the Devonian strata, and as remarkable a contrast with the old red sandstone deposits in England and Scotland; which, however, contain the numerous remains of fishes chiefly in the arenaceous beds. The mountain limestone series of the British islands is, in general, not *rich* in remains of fishes; though local exceptions occur, as at Burdiehouses, near Edinburgh, and the rocks of the Avon, near Bristol.

I have now presented such numerical combinations and (provisional) results as the investigation on which I have been occupied naturally suggested. To push further such calculations and probabilities would be very useless; because it is quite certain that their value will be materially affected by the progress of discovery. That a hundred, or perhaps two hundred, species may yet be discovered in the wide districts of old fossiliferous strata exposed in Devon and Cornwall, is, in my judgment, very probable; for my own examination (with very good assistance from a diligent fellow-labourer) led to the detection of new forms in almost every locality we visited. The labours of Mr. John Lee, in the vicinity of Torquay; those of Mr. Austen, at Newton; of Mr. Pattison, at Petherwin; of Major Harding, near Barnstaple and Tiverton; of Mr. Drury and Mr. Palmer, near Exeter; and of Mr. Williams, in all parts of the district, shew that nearly every part of this region will repay further research.

For the purpose of guiding in a slight degree the inquiries of those who follow us in this field, some notices of localities are appended, from personal observation, and many more will be found in Mr. De la Beche's report on the geology of the district.

NOTICES OF LOCALITIES.

NORTHERN DISTRICT.

Linton Group.

This is the lowest fossiliferous mass of strata in the Northern District, having below it nothing visible but the red and variously coloured grit rocks of the Foreland, in which hitherto no trace of plants or animals have been found. The junction of these rocks is obscured by contortions of the strata. Above are very clearly seen the thick series of laminated grits and shales, mostly red, of Martinhoe and Trentishoe. The total thickness of the Linton group, thus enclosed in red sandstones, is about 1000 feet, and from careful observations it appears that in almost every part of this series Polypiaria, Crinoïdea, or Brachiopoda have left abundant though imperfect traces of their forms.

Lower part.—Near the line of lower junction and alternation with the red beds near Watersmeet and Lynmouth we find layers of *Fenestella antiqua, Orthis longisulcata,* and *Spirifera ostiolata,* which cross in decomposing lines the planes of cleavage, but are parallel to the line of junction of the red and gray grits, and slates. In one of these gray grits I found several impressions, or rather carbonaceous stains, of plants. The red beds yielded no fossils of any kind.

Middle part.—This is seen in the Valley of Rocks, and in the cliffs of Lee Cove, to great advantage. About 500 feet of strata are here exposed, and there is hardly any part of this whole thickness of gray rocks from which fossils cannot be extracted. Half a mile west of Linton, at the entrance of the romantic part of the Valley of Rocks, we find abundance of *Fenestella antiqua,* and columns and joints of Crinoïdea, in layers among the fine-grained slaty beds. The lamination of the rocks is here very perfect on the planes of deposition; but a cleavage structure prevails enough to render the extrication of good specimens very difficult. *Turbinolopsis pluriradialis, Spirifera ostiolata, Spirifera aperturata,* and *Orthis granulosa,* with *Orthis sordida,* may be obtained in best condition from the gray gritty beds in which the cleavage structure is least injurious. Traces of *Favosites polymorpha* also appear.

On the seaward face of the rocks which margin the valley on the north side, along the road which has lately been made, a few Spiriferæ of the species above-named may be found, but seldom in good condition.

At the west end of the Valley of Rocks, the romantic coves of East Lee afford good opportunities of studying the occurrence of fossils on the broad surfaces of deposition, but we obtained few specimens of interest except some very large individuals of *Orthis longisulcata.* The beds here seen are of a different nature from those above, darker in colour, more laminar, with little cleavage, nodular on the surfaces, and ripple-marked. Crinoïdea and fragmented Spiriferæ lie on the beds, and the whole is very like some sections of the shales which underlie mountain limestone.

Upper part.—Beyond West Lee, and in the recess of Woodabay, we see the upper junction of the Linton group with the red series of Martinhoe, and find, close to the junction line near West Lee, the same Fenestellæ and Crinoïdea, with *Orthis longisulcata, Spirifera ostiolata, Orthoceras Ludense,* generally; and in Woodabay, specially, *Bellerophon striatus, Pleurotomaria aspera, Pterinea spinosa,* and other undetermined forms. I am satisfied that at this point a considerable accession may be made to our present list of species from the Linton group.

It may be observed generally, that near the most fossiliferous layers calcareous matter is often rather abundant; the substance of the Polypiaria, Crinoïdea, and shells, is almost universally decomposed away, or filled by brownish powder, at the surface of the rocks, and thus their impressions become visible; but in the interior of the masses this decomposition has not been produced, nor are the fossils really existing there easily discovered.

The total number of species yet obtained from the Linton group is,—

Polypiaria . . .	3
Crinoïdea	1
Mesomyona . . .	1
Brachiopoda . . .	7
Gasteropoda . . .	1
Cephalopoda . . .	2

Of these, three—*viz.*, Pterinea, Bellerophon, and Orthoceras, have only been seen near the top of the deposit.

MARTINHOE GROUP.

These red, brown, gray, and claret-coloured grits and slates have yielded no fossils, but in working among a great number of fragments near Martinhoe, many singular roundish and oval figures appear in the laminated pale red grits, which continually suggest the question whether they may not be fossils in a bad state of conservation. Examination shews no trace of organization.

ILFRACOMBE GROUP.

The argillaceous slates and limestone bands of Combe Martin and Ilfracombe yield fossils far less abundantly than the gray beds of Linton, and seldom at all except near the calcareous layers. If indeed a judgment were formed from the specimens which dealers *may say* have been obtained from these rocks, the statement would be different. After the sight of Major Harding's collections, and actual exploration, the following list was composed:—

Plants.—Some obscure traces and carbonaceous stains occur above the limestone (one of the uppermost bands) of Lee Quarry, near Combe Martin.

Digitiform and divaricating masses, like corals or fucoids, on the surface of the laminated slaty rocks of Combe Martin Bay (common).

Cyathophyllum cæspitosum.—On the top of the limestone, in nodules, at Lee Quarry near Combe Martin, and at West Hagginton.

Strombodes vermicularis.—Quarry at West Hagginton.

Favosites polymorpha.—West Hagginton (abundant.)

Favosites fibrosa.—Hillsborough near Ilfracombe, Lee near Combe Martin, West Hagginton.

Fenestella arthritica.—West Hagginton.

Crinoïdea.—Combe Martin, &c.

Strigocephalus Burtoni.—Bay of Combe Martin (small specimens.)

It was *stated* to us in the Park Quarry, at Combe Martin, that bivalve shells had been found in soft partings between the beds of limestone. The rock itself is not generally fossiliferous. The upper layers of some of the beds at West Hagginton are very like the cleavage-split beds at Hope near Torquay, and yield abundance of corals, but contain very few shells. Among the undetermined fossils which I saw on examining the great heaps of limestone at Combe Martin are a trace of Fenestella, crinoïdal stems, and small spiral shells.

MORTHOE GROUP.

Above the partially calcareous series of Ilfracombe, lies this thick deposit of fine gray, green, &c., slates, not fossiliferous, and other argillaceous and arenaceous beds, of red and different colours, in which we saw no fossils.

PILTON GROUP.

In this group we include the sandstones and slates of Wollacombe, yielding plants; and the series, principally of slate and thin limestone, of Baggy Point, Croyde Bay, the Saunton shore, and Fremington Pill. It is abundantly fossiliferous, especially so in Croyde Bay, at Marwood, and Pilton; at Brushford, near Dulverton, and Clayhanger.

Altogether this series has yielded by far the largest proportion of the fossils of North Devon; and it is probable that further search would at once discover many more species, and prove the nearly uniform character in respect of organic contents of the whole range of the same beds. Observable differences, however, mark the different sorts of rock: thus it is in the sandstone beds of Marwood that principally occur the supposed Cucullææ and Cypricardiæ; in the slaty and thin gritty beds of Pilton and Brushford lie Trilobites and *Spirifera calcarata;* while in the thin limestone bands and nodules of Baggy Point many other forms appear, but most of those above mentioned are absent. This variation of organic forms, according to the mineral nature of the deposit, has been recognised in every system of stratified rocks: it contributes at once to demonstrate the residence on the spot where they now occur of the species which are buried, and to confirm in detail that dependence of the occurrence of organic forms *on co-existent local physical conditions*, which cannot be overlooked on a large scale, in the alternations of fossiliferous and non-fossiliferous strata so remarkable in North Devon—a dependence which the analogy of existing nature teaches us to expect and to search for; but which, though recognised by every careful observer, has been too little regarded in geological reasoning.

The catalogue contains 73 species of fossils from this group; of which 34 were found at Brushford, in the east of the district; and 59 at Pilton, Croyde, &c., at the west end; so that 20 have been found which are common to the two ends of the range. If it be remembered that a single locality (Brushford) twice visited, has yielded this result, and that, moreover, the fossils of Marwood and Baggy Point, which are peculiar to those places (the former in grit, the latter in limestone), amount to about 13, we shall find out of 60 species remaining, 33 per cent. of the whole, or 50 per cent. of those which occur at either place, common to the whole range. But this experimental result is much below the probable and theoretical truth: for if every one of the 60 species really did occur at each place, yet until every one had been collected, this fact could not appear; and if only half had been collected at each place, the chances are that of this number only half would be common to the two localities.* This would be one-third of the number of species collected altogether, and one-fourth of the whole number occurring at both places.

It will be useful to notice a few localities in detail.

South side of Baggy Point.—Here the strike of the slaty rocks is nearly east and west, and the dip is steep to the south; the beds being crossed by nearly vertical (but dipping south) cleavage. The layers of fossils are numerous, and obvious on the weathered surfaces of the slate by their decomposition, and the brown powder which abounds in place of the shells. Parallel to these lines are some irregular bands of limestone full of shells, generally not the same as those in the slates. By breaking a great number of specimens on the spot, and carrying away many pieces to be examined at home, we succeeded in adding some species to the catalogue, which have not yet been seen elsewhere. The most remarkable of these were *Terebratula laticosta, Nucula lineata, N. plicata, Avicula reticulata, Natica meridionalis.* Besides these, *Bellerophon trilobatus* deserves mention.

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* *See* on this subject page 178.

South side of Croyde Bay.—The slaty beds are here nearly vertical, and interlaminated by irregular sandy layers. There are fossils in each kind of rock, but a few of the arenaceous bands are most productive. In one layer of this kind we found *Fenestella antiqua, Glauconome bipinnata, Leptæna analoga, Spirifera calcarata, Orthis interlineata,* &c., and several specimens of parts of Calymene, &c.

Top Orchard Quarry (1¼ mile north of Barnstaple).—At Pilton, on this road, the beds are seen to dip variously, north as well as south, and are fossiliferous. In Top Orchard quarry fossils are numerous, especially in narrow layers, and on surfaces of shale (rather than slate). The strata dip to the south, are crossed by cleavage also dipping south, and are interlaminated by gritty and calcareous layers, both partially fossiliferous. On the exposed heaps many good specimens may be found, and others may be extracted from the weathered face of the rocks. After a new operation of quarrying, a careful scrutiny would be well repaid.

Brushford, near Dulverton.—On the road-side, between Bampton and Dulverton, within half-a-mile of Brushford, is a small quarry, at the end of a wood. The waste heaps of this quarry, laid by the road side, yielded many fossils, and induced two visits to the excavation, which were well repaid. Like many other of the sections on this range of rocks, the mass of slate is in nearly vertical strata, and subject to cleavage. Much of it is internally of a dark colour, externally yellowish; it is interlaminated by a few calcareous bands, of no other importance than as marks of the stratification. In and parallel to these lie abundance of fossils, the best specimens being obtainable from the slaty laminæ, where the cleavage is least injurious. Viewed with respect to the interest which belongs to individual species, this is the most prolific and valuable of all the localities I have seen on the range of the Pilton beds. We find at this place

Turbinolopsides in abundance, Pentremites, Cyathocrinus, *Spirifera microgemma, Sp. megaloba, Loxonema rugifera, Bellerophon globatus,* Calymene, &c.

CARBONACEOUS GROUP.

The exact circumstances of the passage from the upper part of the Pilton group to the lower part of the carbonaceous group, or series of strata—including the limestones and shales of Swimbridge, the cherty grits and white accompanying laminæ of Coddon Hill, and the culmiferous deposits—are scarcely anywhere completely seen in North Devon. There is usually a longitudinal valley on the line of junction, which obscures the phenomena. Fremington Pill is perhaps the best locality for observation of this passage. Once fairly in the present series, the few fossils it contains are found to be distinct from those of the other groups below. The limestone yields Posidoniæ and Goniatites, perhaps as yet unknown in the lower formations; and there is an almost or even total absence of the corals, Brachiopoda, &c., which are so common in them. I found a few shells, in addition to those previously known, by searching diligently the Coddon Hill grits near Barnstaple, but labours of this kind were almost fruitless among the unprolific limestones of Venn, Swimbridge, and Bampton. The last-named locality, however, gave us a new Goniatite, in the laminated shales which usually accompany the limestone.

The following localities deserve notice :—

Swimbridge.—Here the limestone is in many beds of unequal thickness and qualities; the whole being violently and variously contorted. The beds of limestone are mostly black, compact, crossed by white veins of calc spar, and alternating with shales. In some places they are converted to a rotten blackish mass, like powdery coked coal. Some of the stone is granular and crinoïdal, and rarely some whitish specks (of coral ?) appear in the accompanying parts.

Coddon Hill.—The beds which in this range of hills overlie the shales and limestones of Swimbridge and Venn, are a whitish, or gray, or black chert, in thin striped beds, like some of the bedded chert of Leyburn, in Wensleydale, and other parts of the north of England. With these lie white arenaceous and argillaceous layers, mostly very soft, and sometimes cleavable. They resemble a little some examples of the pencil bed (whitened shales in contact with the trap) of Teesdale, and the course of the Cleveland dyke. Other parts shew black and reddish shales. In these laminated beds lie Goniatites, Orthoceratites, Terebratulæ, and Posidoniæ. The debitumenized condition of these white shales parallel to the black bituminous shales of Swimbridge, is remarkable; and it is a fact repeated not only on the northern range near Bampton, but also on the southern range near Launceston and Lew Trenchard. In a quarry on this range, near Tawstock, Major Harding found *Turbinolopsis pauciradialis*.

Bampton.—At and near this place are two bands of the limestone of the carbonaceous group, one south, the other north of the town. In shales on the northern side of the south band of limestone, and therefore apparently beneath it (but the rock is very contorted), we find abundance of Posidoniæ covering the regular plane surfaces, and disclosed by easy cleavage parallel to the stratification. Young and old individuals may here be seen together. Goniatites also appear, and among them one which I did not see elsewhere (*Goniatites spiralis*); but I did not find in the Coddon Hill grits, which underlie the lowest limestone, any remains of shells or plants. There are mixed with the limestone, some rotten beds, and many shaly laminæ.

Westleigh.—The limestone is here raised from under new red sandstone, in a detached ridge, on an axis with dips to the north-west (30°), and to the south-east (50°). It is thick, and partly in solid beds, some of which are crinoïdal, and yield *Spirifera lineata, Leptæna Martini (?)*, Acroculia (?). On the southern slope are many thin laminated beds of shale, very full of Goniatites, several species, a few Posidoniæ, one Brachiopod, and several plants. These shales are white, or of a flesh colour, a circumstance which is much noticed at several places in this neighbourhood. Near Hockley Bridge are black shaly beds. Some of the limestone is remarkable from being a sort of oolite or pisolite, the grains being oval and black.

General Considerations.

It will appear, from the preceding statements, and from the geological descriptions in Mr. De la Beche's report, that in North Devon there exist three principal orders or assemblages of deposits, each mineralogically characterizable, and each exhibiting a definite relation to the remains of organic life.

That which upon the whole prevails toward the lower part of the whole mass, is a red series of grits and shales, with occasional admixtures of gray, liver, and claret-coloured tints. It is deficient of limestone, and contains no organic remains.

The middle portion, indeed the greater portion of the whole district is made up of gray, green, blue, purplish, or blackish shales or slates (according as cleavage is developed), with admixtures of limestone in beds, nodules, and concretions; and layers of gray, or yellowish, or brownish grits. In this calcareo-argillaceous series, organic remains of marine invertebral animals prevail generally (least so where the series is purely argillaceous), and in particular arenaceous layers are a few terrestrial plants. The number of these marine invertebral fossils is greatest toward the upper part of the whole deposit, and least in the middle.

The last and uppermost of the three assemblages of strata in North Devon, is as much remarkable by the absence of red grits, and gray or green slates, as for any positive characters. Yet in the frequent interlamination of gray grits and shales,—in the frequently or locally carbonaceous character of these,—in the thick and continuous limestones alternating with black shales,—in the hard cherty grits, and white shales or grits which lie above and below the limestones,—we see clearly sedimentary depositions of another origin, from another direction.

In short, each of the great orders of strata here noticed belongs to a series of physical conditions of different local origin, and the difference of the suites of organic remains is due to this original difference of the circumstances of their existence. These circumstances appear partly dependent on time (for the different assemblages of rocks have their general order of dependence among one another), but not absolutely so, since where we see the red and gray systems mix by mutual interlamination, the red contain no fossils, while they may be found in the gray.

In reviewing the whole series of organic forms observed in this district, we may remark that three of the groups have positive and charactéristic peculiarities. It is in the Ilfracombe group that corals abound; in the unimportant limestones of the other groups there are few or none; it is in the Swimbridge, or carbonaceous group, that Goniatites prevail; and the Pilton group contains the Trilobites.

Considered in general, it is this latter portion of the series which is most productive. At least 73 have been found in it, while in the group above only 14, in the Ilfracombe series only 8, and in the Linton group only 15, have been yet met with.

Excluding the remains of Crinoïdea the relative zoological affinities of these groups appear thus:—

	Species.
Common to the Linton and Ilfracombe groups	1
„ Linton and Pilton groups	5
„ Ilfracombe and Pilton groups	0

So that here it is plain that resemblance and difference coexistent on physical conditions has been so influential on organized life, as to have overbalanced the effects dependent on relative age.

If we include the Crinoïdea, the following would be the comparison:—

	Species.
Linton and Ilfracombe	2
Linton and Pilton	6
Ilfracombe and Pilton	1

As a corollary to these facts, we may admit, in the ancient sea of North Devon, three orders of detrital accumulation, that is to say, the inpouring of sediments from different directions, and from wasting lands or shores of different mineral constitution; that of these the two earlier orders alternated in their influence, while, after the cessation of each, a third order predominated; that one of these early sedimentary aggregates (the red series) was wholly devoid of, or unfavourable to, the development of marine organic life, while another (the gray) was as remarkably favourable; and the last (carbonaceous) series included some spoils from the land. At intervals, in the deposition of the gray and the carbonaceous groups, limestones were accumulated, having somewhat of the aspect of coral reefs in the earlier, but not at all in the later, period.

As to the direction in which the three orders of sediments arrived in the basin of North Devon, perhaps it may be found that the carbonaceous series came from the west, since in that direction its gritty portion appears most abundant and varied, while on the eastern side its calcareous portion is more developed.

It is difficult to find safe grounds for a conclusion regarding the local origin of the red and the gray drifts. The former appear to abound in the north-east of the district, as if their local origin were in that direction, which might connect them with the red millstone grit, and old red sandstones of the Avon; while the latter appear more varied, and probably are thicker toward the north-west.

SOUTHERN DISTRICT.

CARBONACEOUS GROUP.

Following the line of the carbonaceous group of North Devon to the east, it is lost under superimposed red marls and sandstones: these range nearly north and south across the general strike of the carbonaceous group, and conceal it, except where small ridges and axes thereof rise through the red rocks, as about Holcombe Rogus and Exeter. On the west, the carbonaceous group occupies the coast from Fremington nearly to Tintagel, and on the south it follows a line much bent by the effect of the protruding granitic masses, especially of Dartmoor. In the centre of this great district no limestone occurs, and there are no other fossils than obscure marks of plants, or mere carbonaceous stains; but on the southern border the limestone bands reappear almost exactly as on the northern side, with similar mineral characters and accompaniments, and similar or identical organic remains: for example, at Trescott, near Launceston, Lew Trenchard, Bridestow, and Okehampton. A valley on the outcrop side of the limestone is usually seen to divide it from the subjacent slaty rocks, as in the northern district. The general view of this southern range gives the following terms:—

Upper or Grit Group of Central Devon.

Upper shale group—a mass chiefly of dark shales.—Carbonaceous grits and shales, the lowest part being the Coddon Hill chert series.

Middle or calcareous group.—Limestone, mostly black, irregularly bedded, associated with shales, often resting on trap rock, and fossiliferous.

Lower shale group. —Black argillaceous plate, or very laminar shale, not subject to slaty cleavage, and scarcely fossiliferous.

Among the localities deserving of notice, Lew Trenchard and Trescott were those to which we devoted most attention.

Lew Trenchard.—On the quarried edge of the range of hill north of the valley of Lew Trenchard, the argillaceous and arenaceous laminar beds, white, or coloured by oxide of manganese, which correspond to those of Coddon Hill, in North Devon, contain Calamites, Asterophyllites, Neuropteris, and a Goniatite. Below, in the valley, are quarries of black limestone, with white spar veins and iron pyrites, dipping north, with undulations. In the upper part of the quarries are shaly partings, rich in Posidoniæ, which lie across and impress one another. These shaly laminæ break into rhomboidal masses. Elsewhere in the quarries fossils appear scarce. I found no Goniatites in the limestone.

Trescott.—On the top of the hill we have, dipping north, soft and hard white, pink stained, and black layers, the equivalent of the Coddon Hill grits, with quartz veins. Below are laminated gray grits and shales. Then thick dark gray or black limestone, covered by black shale resting on trap. In the limestone are Goniatites, not uncommon; they also occur less plentifully in the shale. I also found Posidoniæ, Crinoidal joints, Neuropteris, and Lepidostrobi. Much pyrites is seen. This quarry deserves careful research.

PETHERWIN GROUP.

Rising to the south, at a very moderate angle, and to a very moderate height, from under the black shales which form the lower part of the carbonaceous group near Launceston, we have a series of argillaceous, laminated beds, only partially subject to slaty cleavage, and enclosing concretionary balls, or more or less irregular bands and strata of limestone. The colour of the whole is light grey, or greenish. The shaly laminæ above the principal mass of limestone are called the 'head,' and in this are found the greater number of the organic remains for which the group is remarkable. From some of the nodules of impure limestone, imperfectly burnt in the kiln, we obtained, by Mr. Pattison's guidance, many Goniatites and Clymeniæ by easy fracture; others are detected by the workmen who quarry and break the stone, and remove the 'head.'

Three or more quarries are seen on this range of limestone, two of them now worked, on each side of the road from Launceston to Petherwin; the other, called Landlake, is a mile further down the little valley in which all the quarries lie. There is, or appears to be, at Landlake quarry, some *unconformity* between the black shaly beds, which are at the base of the carbonaceous group, and the grey calciferous rocks of the Petherwin group. These latter dip north 30° east; the former dip south 5° east. The line of valley is here the line of junction, a circumstance which diminishes the importance of the observation as a ground for inferring a real unconformity, since it is a very common fact that along the lines of valleys the dips are *locally deranged.* There is, moreover, some appearance of a minute reversal of the dip of the black shales at the part nearest the junction.

From the two quarries on the line of these beds, we have seen upwards of 60 species of fossils, collected chiefly by Mr. Pattison of Launceston, Mr. Holl, and ourselves. They present no species common to the carbonaceous group above; and upon the whole have a peculiar aspect from the remarkable abundance of Clymeniæ and Goniatites, mostly identical with or very closely allied to species described by Count Munster from the Fichtelgebirge. As Clymeniæ are among the rarest fossils of the Irish limestone,* and they are not common in Devon, and in Cornwall occur almost exclusively at South Petherwin, we are forced to ascribe to *peculiar local conditions* the unexpected plenty of these beautiful fossils here. Even within the limited range of the three quarries near Petherwin, differences appear in the distribution of organic remains. Landlake quarry, farthest to the east, and *perhaps* containing beds nearest to the base of the carbonaceous group, is richest in Cephalopoda; the middle quarry is very productive of *Spirifera disjuncta,* and *Sp. calcarata,* &c., and I there obtained *Goniatites insignis;* while the upper or western quarry yielded us but few fossils of any description. If on the range of nearly the same beds, the Tintagel slates are very different in aspect, and less rich in fossils. Their lamination is parallel to the planes of deposition, and the large Spiriferæ which occur in these laminæ are seen nowhere else of such gigantic dimensions.

On comparing the 67 species of the Petherwin beds with the fossils of the groups of North Devon, we find at least 21 identical with species which also occur in the Pilton group, five which are identical with forms in the Linton group, and one repeated in the Ilfracombe limestone.

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* None have yet been published, but Mr. W. Gilbertson's collection is believed to contain one specimen, and M. De Verneuil is supposed to possess another.

FOSSILS IN THE COUNTRY BETWEEN PETHERWIN AND PLYMOUTH.

To determine truly the relative position on the scale of the Devonian and Cornish strata of the Petherwin and Plymouth groups, is a point of the highest and most essential importance, for the foundation of a correct induction as to the true geological sequence of the deposits of the whole of Cornwall, Devon, and West Somerset. It is also one of the most difficult problems which can be proposed for geological observation, especially if that be confined to examination of what are really the most important phenomena, *viz.*, the mineral nature and relative positions of these groups of strata, and the country which intervenes.

The principal part of this difficulty arises from the nature of the country intervening between the groups; for not only does it present rocks not common to either, but these are found so variously posited, and so much disturbed by the crossing of mineral veins and trap courses between the granites of Dartmoor and the Camelford Hills, that a more embarrassing line of country can scarcely be imagined. Add to this the singular fact that in the same quarry the dips at the surface often contradict those at a small depth, and that in a single face of rock the beds are *unequally contorted*, and shew a sort of *unconformity between one another*, (as in descending the hill from Launceston to Landue, north side of the valley)* while in other cases it is supposed that a similar unconformity obtains between strata of different age (as between the carbonaceous and Petherwin groups south of Landue noticed by Mr. De la Beche in his report); and it will be seen that hardly any amount of labour can be assigned, which shall be sufficient to clear up this single and most essential point. The following observations were made in company with Mr. Pattison, in hope of partially unravelling the mystery.

South of Landue some of the Petherwin fossils appear, especially *Spirifera disjuncta*, at a point in the road where unconformity is supposed to occur, *in the lower beds only,* the general dip being *northerly.*

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* A less striking case appears in the Trescott limestone quarry.

On the banks of the Tamar, under ' Cathamartha ' cottage, the hard grits, partially contorted and traversed by cleavage, appear, and in them I found obscure traces of Spiriferæ (dip south, 40° west, 25°). About Innisfoot, on each side of the Tamar, gritty rocks project on the hill-sides in ridges with dip to south-east (10°, 30°, and more.)

Descending the hill from Resair to Beal's Mill, we find at the hill-foot, north of the stream, very much laminated argillaceous and micaceous beds, dipping south or south by east (10° or 20°). Very broad plane surfaces of a laminated slaty rock appear on the south side of the Mill, with a dip south 5° west (37°). Some thin gritty layers occur also. The slate (for so it must be called) is of a dark colour, and very uniform texture; some of the gritty bands are coarse-grained and even pebbly. About one-third of a mile south of Beal's Mill, on the west of the road, is a slate quarry, *whose laminæ, as at Beal's Bridge, and at Tintagel,* are parallel to the plane of deposition. On the surfaces of the laminæ, which dip south 30° west, (18°), are Orthocerata, (Crinoïdea?), abundance of Goniatites, and some remains of plants, one a fluted but apparently not articulated stem. There seem to be two sorts of Goniatites, one originally involute, the other with partially exposed volutions. No Posidoniæ appear. The slate is of a uniform dark colour, and splits very thin.

The dip (south 30° west) observed at the slate quarry continues to prevail toward Horn Bridge, where we have a more greenish slaty rock with quartz veins. The dips vary (north 10° west, south 20° west, south 10° east, and north-west). In a great quarry above Horn Bridge, east of the Tamar, we find the dip west, and the slate green, as at Tintagel and Mill Hill (near Tavistock), with oval white or reddish metalloid spaces or spots scattered on the plane surfaces. Proceeding toward Hartwell, the same dip to the west, and the same kind of rock, appear. At Hartwell, the dip becomes east-north-east, then east (20°); and so continues to Mill Hill quarry, where the slates are light coloured. Between this point and Tavistock grits and green and black slaty beds appear, with various dips, that to the south prevailing.

On the line from Tavistock, by Lumber Bridge, the aqueduct, and Roman's Lee, to Dedham Bridge, greenish schistose rather than slaty rocks prevail, and are frequently contorted, especially near the veins of quartz, which are rather numerous. The dips vary, but commonly include some southing. Probably these may be classed as of the same group with the slate of Mill Hill and Tintagel: slaty cleavage is not commonly well developed in any part of this country across the laminæ of deposition. The same green schistose rocks continue to Buckland Abbey, where the dip is south-west. At Uphill, similar rocks have an undulated dip to south-west. Similar rocks appear as far as Tamerton, there dipping south-west and south. Between this place and Whitestone rocks of the same composition are less laminar than usual, and the dip is south-east. Hence to Tamerton the cutting of the road shews a dip south by west.

Between Tamerton and St. Budeaux, to the summit of the road, the dips appear south, south 30° west, south 40° west (20° to 80°), in rocks not materially different. At the summit appears a narrow anticlinal, and on the centre of it purple and whitish colours in fine slaty rocks appear, and begin to predominate.

The dips at the anticlinal are north 10° west, and south 10° east; the strike north 80° east. The cleavage structure is nearly parallel to the northern dip. From this point, across the undulated ground to St. Budeaux, the prevalent dips are south, south 10° east; and the rocks are gray beds, blue and gray beds, purple glossy slate, a thick series, succeeded by alternating purple and gray slates (the former predominating). Purple slate abounds at Saltash, dipping south 25° east (65°), with cleavage planes nearly vertical, but rather inclined to the north.

From Saltash to Plymouth, on the new road, are purple slates, trappean rock and conglomerates, alternating with schistose strata, succeeded by slates in vast abundance, gray or purple, but principally of the latter hue, as far as the limestone range of Plymouth. This vast series universally dips in a southern direction, and commonly at 45°; a dip continued in the limestone of Plymouth and Oreston.

In the whole range of country, from the slate quarry near Beal's Bridge to Plymouth, comprising gritty rocks, green schists, green, gray, and purple slates, &c., our anxious search for fossils was not recompensed by the occurrence of a single relique of a vegetable or animal nature. But the limestone, which by its relative position appears a later deposit, contains organic remains through nearly its whole mass.

1. From these observations, judged of without reference to other

localities, it appears probable or certain, that the southern parts of the strata which intervene between the Petherwin group and the Plymouth group, and which appear almost non-fossiliferous, are beneath this latter group: an inference, from the continuity of the masses and general determinateness of a southward dip, which is confirmed by the continuity of this dip still further to the south *in other strata*, and the connexion of the courses of the strata to the east from the Tamar toward Torbay.

2. Whether the other or northern part of the series of strata intervening between the Petherwin group and that of Plymouth is beneath the Petherwin beds, is very uncertain. The gritty rocks of Mount Pleasant and Cathamartha are in this case; for these, with the black, gray, and green slaty rocks, found to be fossiliferous at Beal's Bridge, and to rest upon those gray gritty rocks, appear to have such a connexion with the carbonaceous grits near Launceston, and such a relation to the south-east end of the Petherwin beds, as might be consistent with an opinion of their superior position.

PLYMOUTH GROUP.

The appearance of this series of limestones, shales or slates, and sandstones, is nowhere more complete and instructive than about Plymouth and in the vicinity, though some particular facts of importance may be best studied in other places.

Plymouth and the neighbouring coast.—The northern boundary line of the great limestone mass, resting everywhere on the purple or gray slate rock, ranges nearly east and west, and dips most generally, if not universally, to the south, at the high angle of 45°. In several places at Devonport and Stonehouse, the numerous and regular joints at right angles to this dip might deceive an observer into the belief of their being planes of stratification, but the laminæ of red clay and sandy beds which often alternate with the limestone, and always dip south, soon correct the error.

Choosing for a line of section the very favourably circumstanced east side of Plymouth Sound, and commencing with the slaty rocks near the old turnpike, east of Plymouth, we pass from north to south across the strike of the beds, and find the following ascending series:—

localities, it appears probable or certain, that the southern parts of the strata which intervene between the Petherwin group and the Plymouth group, and which appear almost non-fossiliferous, are beneath this latter group: an inference, from the continuity of the masses and general determinateness of a southward dip, which is confirmed by the continuity of this dip still further to the south *in other strata,* and the connexion of the courses of the strata to the east from the Tamar toward Torbay.

2. Whether the other or northern part of the series of strata intervening between the Petherwin group and that of Plymouth is beneath the Petherwin beds, is very uncertain. The gritty rocks of Mount Pleasant and Cathamartha are in this case; for these, with the black, gray, and green slaty rocks, found to be fossiliferous at Beal's Bridge, and to rest upon those gray gritty rocks, appear to have such a connexion with the carbonaceous grits near Launceston, and such a relation to the south-east end of the Petherwin beds, as might be consistent with an opinion of their superior position.

PLYMOUTH GROUP.

The appearance of this series of limestones, shales or slates, and sandstones, is nowhere more complete and instructive than about Plymouth and in the vicinity, though some particular facts of importance may be best studied in other places.

Plymouth and the neighbouring coast.—The northern boundary line of the great limestone mass, resting everywhere on the purple or gray slate rock, ranges nearly east and west, and dips most generally, if not universally, to the south, at the high angle of 45°. In several places at Devonport and Stonehouse, the numerous and regular joints at right angles to this dip might deceive an observer into the belief of their being planes of stratification, but the laminæ of red clay and sandy beds which often alternate with the limestone, and always dip south, soon correct the error.

Choosing for a line of section the very favourably circumstanced east side of Plymouth Sound, and commencing with the slaty rocks near the old turnpike, east of Plymouth, we pass from north to south across the strike of the beds, and find the following ascending series:—

1. The purple slaty rocks finely laminated and marked by cleavage, both laminæ and cleavage dipping south, but unequally.

2. The great mass of the Plymouth limestone, worked in the Catsdown-quarries on the north, and in Oreston quarry and the Breakwater quarries at Turnchapel, on the south side of Catwater. On both sides the dip is south; the stone is mostly dark, frequently banded with different hues, some is light-coloured; most of it *appears* laminated, though it is really solid: some beds are mere coral masses. In the upper part, near Turnchapel, red shales, yellow ochry beds, and purple masses of oxide of iron, form a parting in the limestone, and have a varying dip of about 70° to the south.

3. Laminated schistose beds, irregular beds of trappean rock, with irregular and nodular admixtures of limestone, occupy the shore for some distance.

4. Blue and gray schistose beds, dipping south-east moderately, succeed, and yield, in gray slaty beds, and nodular limestone, Encrinites, Brachiopoda, Turbinolopsis, and some unenumerated shells. The limestone nodules contain black (carbonaceous?) spots.

5. Carbonaceous and gritty beds.
Argillaceous contorted schists.
Calcareous laminæ fossiliferous.
Schists.
Schists and thin grits.
Laminated brown and red grits.
Schists.

Layers of nodular limestones with Crinoïdea, in argillaceous irony schists; a band of slaty fragments, and colour stripes, are crossed by cleavage.

6. Red grits, hard, coarse.

Purple schists and fossils in bands (Spiriferæ, Encrinites, &c.) This series is amazingly contorted, and contains ironstone layers and undulated quartz laminæ between the *beds*.

Red grits, with gray alternations, often ripple-marked on the surface, and bearing much resemblance to the beds of Martinhoe in North Devon, appear to lie over the blue or purple fossiliferous beds; but the junctions are complicated by amazing contortions, just as happens where in North Devon the Foreland sandstones touch the Linton gray beds. The red beds form a hill over

Staddon Point, and dip to the south-east (45° and 70°), so as to sink below the sea rapidly near the centre of Boveysand Bay, where they are covered by steeply acclined beds of bluish, grayish, and whitish shales. Much contortion prevails here.

7. Blue and gray shales, and with thin calcareous bands of Boveysand Bay. They are somewhat fossiliferous; containing Orthoceras, Turbinolopsis, Crinoïdea, Spirifera, and an Alga; dip south 40°.

The same series appears on the western side of the Sound, and is in the same manner and parts fossiliferous. Both the limestones and red sandstone series continue on the eastward strike, and except by some improbable conjecture, the evidence of the superposition of fossiliferous slaty rocks and red sandstones, on the Plymouth limestone, cannot be shaken. It is indeed remarkable, that at the junction of rocks (both in South and North Devon) of different nature (as red sandstone and slaty rocks, especially), contortions and displacements abound, so as to render the evidence exceedingly embarrassing, until the phenomena are considered on a large scale.

Yealmpton.—Passing eastward from Plymouth, we find the limestone ranges discontinuously exhibited at several points, and thus perceive their geological relation to those of Torbay. One of these points, Yealmpton, has yielded Trilobites and some other fossils in the slaty rocks associated with the limestone. The specimens are in the collection of the Natural History Society at Plymouth.

South-eastern border of Dartmoor.—We found, amidst the argillaceous and sandy strata which slope away from the granite on the south-east side of Dartmoor, several places which yielded fossils.

At Ilsington, plants were found lying in beds resembling the carbonaceous rocks of central Devon.

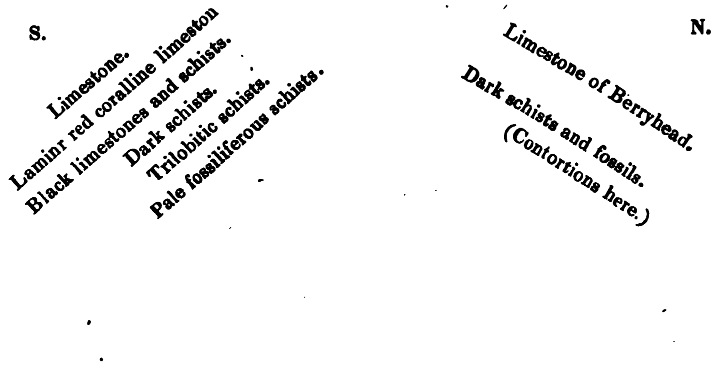
On a line from Bickington, by Combe, to Dartmoor, a very interesting section appears, especially at Bickington, and for about one mile west of that place. Bickington stands on dark very slightly fossiliferous limestone, apparently resembling some of the lower beds of Babbacombe, north of Torquay. This rock dips south-eastward 25°. Apparently from under it (a small valley intervening), rise, with a dip of 20° east, hard grit rocks like those of the carbonaceous series of North Devon, and perfectly resembling rocks of this series south of Chudleigh. This rock is variously contorted, and gives place, as we advance westward, to softer yellow and gray argillaceous beds, with Goniatites, Orthides, Sanguinolaria, &c., the dips varying (north 20° east, and south 30° east). Beyond these are dry dark-coloured cherty grits, with thin light-coloured partings, as at Coddon Hill. If these beds are a part of the great carbonaceous group, we cannot explain their occurrence, without violating the succession of beds, or supposing an actual passage of the carbonaceous group under the limestone, but by admitting a great fault along the valley which separates the Bickington limestone from the gritty beds on the west. But I am not aware of any independent evidence that such a fault exists.

Appearances somewhat similar appear on the line from Ashburton to Holme; and in light-coloured beds of argillaceous slate, which are exposed on the north side of the Dart, a few Crinoïdea and other fossils were obtained.

Chudleigh.—The limestone, here 200 feet thick, rests on soft greenish schistose beds, somewhat like that of Combe just noticed, but not fossiliferous. Above the limestone lie green and red nodular and laminated schists, and these are covered by coarse gray carbonaceous grits. The dips vary considerably. The limestone yields large spiral shells, Stromatopora, Caunopora, &c.

Newton Bushel.—From the limestone quarries in this neighbourhood Mr. Austen has obtained a very large and instructive series of specimens, a great proportion of them well exhibited through the decomposition of the limestone. At Chircombe Bridge occurred *Calceola sandalina.*

Mudstone Bay.—Here, between the promontories of Berryhead and Sharkham Point, an anticlinal axis (its steepest dip being north, under Berryhead) brings to view the schistose rocks below the limestone. The horns of the bay being limestone, the hollow is schist. The series of strata is nearly thus:—


S.
Limestone.
Laminr red coralline limeston
Black limestones and schists.
Dark schists.
Trilobitic schists.
Pale fossiliferous schists.
N.
Limestone of Berryhead.
Dark schists and fossils.
(Contortions here.)

Above all to the south is a series of red sandstones and schists; so that in general terms the contemporaneity of the Mudstone Bay limestone group to the limestone of Plymouth, becomes a probable inference; and though the fossiliferous shales of Mudstone Bay which underlie the limestone are not identical with the purple slates in the same place at Plymouth, yet as the Plymouth limestone thins out and is represented by calciferous shales in Whitesand Bay, and westward in Cornwall, so we may understand these richly fossiliferous shales at Mudstone to represent a lower portion of the limestone.

How variable is the basis of the limestone may be known by attending to another locality.

Meadsfoot Sands.—In this bay, between the Hope mass of limestone and the hill above Torquay, we have a series of fossiliferous strata, different from those of Mudstone Bay, and yielding two or three different fossils, yet in the same manner exposed in an anticlinal axis, between prominent points of limestone, dipping north-east towards Hope, and south-west to Torbay. There is a dislocation on the north-east side, which depresses the beds on the east, and exhibits the top of the limestone at Hope. The series is principally composed of argillaceous schists, mostly dark, often weather-stained to redness, with thin bands of calcareous matter. Slaty cleavage is developed in the shales. The fossils appear on weathered lines parallel to the laminæ of deposition, and the whole appearance is like that of the calciferous shales on the north side of Croyde Bay, or south side of Baggy Point. I found one specimen of a large Trilobite here. There are also sandy beds of no great thickness in the upper part of the section, which yield fossils, and look like the gritty beds of Croyde Bay, and Baggy Point.

Hope.—The base of the limestone of Babbacombe and Torquay is seen west of the point called Hope's Nose, and on the west side of the dislocation, which ranges north and south from Meadsfoot Sands. The top of the limestone, partly covered by black shales, is also seen a little south of the Nose, and both below, in, and above the limestone, fossils occur, very plentifully in the upper laminated calcareous beds, but there they are much injured by slaty cleavage.

Babbacombe.—Here we see in the western part of the bay, for some distance from the junction with the red sandstone, the base of the limestone series, dipping south-east, and partially resting on and penetrated by trap. These lower beds are black shales with limestone bands, and are partially fossiliferous, yielding Cyathophylla, Favosites, a peculiar Pecten, &c.

Dartington, near Totness.—The limestone, here quarried at a junction of roads, is in a favourable condition for extracting corals, and being extensively worked, the series of its beds is to a certain extent well seen. It rests on slaty rock, with a singular waved and scolloped surface. The upper beds are dolomitic, or as they would be called in the north of England, 'Dun' limestone: below are gray and black bedded limestones, with many partings of shale. Favosites, Cyathophylla, Stromatopora, Atrypa, &c., occur plentifully.

EXPLANATION OF THE PLATES.

In arranging the figures and descriptions, I was desirous of giving to the reader the advantage of a continuous series of numbers for double reference, the same numbers being used on the plates and in the text; and this object has been accomplished with but little violation of natural affinities in the plates, and none that is material in the text. For example, even in the case of *Caunopora ramosa*, which is numbered 22 in the text, but described after Stromatopora, which genus ends with No. 27, the number 22 and the name of Caunopora are inserted in the text, with a reference to the page where the description occurs. Any species may thus be referred to by its appropriate number, even without regarding the page or the plate where the description or figure is introduced.

Plate 1, *figs.* 1-4.

1. Turbinolopsis celtica.

a, b, c, casts of interior; shewing the complication of the centre, and in *a*, concentric undulations.

d, transverse section near the base, shewing the usual number of furrows, which are doubled toward the margin. At the extremities of the transverse axis of this elliptically compressed specimen, the furrows are pressed together, an appearance common in the slaty rocks of Devon.

e, sketch of the exterior case, concentrically and longitudinally striated, and of the internal lamellæ.

f, impression of the denticulated edges of the lamellæ, in a specimen which has been obliquely compressed.

g, magnified drawing of the impressions of the lamellæ, taken from the specimen marked *a*.

2. Turbinolopsis bina.

a, cast of interior.

b, the same magnified.

c, a portion still more magnified, to shew the relative position of the ornaments left by the impression of the denticulated edges of the lamellæ.

3 A. Young specimen of TURBINOLIA FUNGITES. *Auct. From the mountain limestone, for comparison with the Devonian species.*

a, the general aspect of a specimen deficient at the apex of the cone.
b, cast of the interior.
c, magnified view of the impressions left by the denticulated lamellæ.

4. TURBINOLOPSIS PAUCIRADIALIS.

a, cast of the interior.
b, some of the impressions of the lamellæ enlarged.

Plate 2, *figs.* 5-7.

5 *α*. TURBINOLOPSIS PLURIRADIALIS, *var.*

a, cast of the interior, shewing concentric undulations.
b, cast of the interior, shewing a division of the lamellæ into two parcels.
c, cast of the interior.
d, magnified view of a division of the lamella.

5 *β*.

e, cast of the interior.
f, side view of an internal cast.
g, magnified view of the impressions left by the denticulated lamellæ.
h, another example magnified.
i, side view of one lamella, *as inferred from its impressions.*

6 B. TURBINOLOPSIS ELONGATA. *From the sandstone of May Hill, for comparison with the Devonian species.*

7 C. TURBINOLOPSIS RUGOSA. *From the summit of Snowdon, for comparison with the Devonian species.*

a, cast of the interior, a full-grown specimen.
b, cast of the interior, a young specimen.
c, impressions of the lamellæ, magnified.

Plate 3, *figs.* 8-10.

8. AMPLEXUS TORTUOSUS.

a, broken specimens, to shew the interior arrangements, especially the irregular transverse plates, and their furrowed edges.
b, a theoretical drawing, designed to shew the structure of the coral more completely than can be seen in any single example.

9. CYATHOPHYLLUM TURBINATUM.

The drawing represents a transverse section.

10. CYATHOPYLLUM CÆSPITOSUM.

a, the appearance of the termination of a branch.
b, lateral view of a branch.
c, magnified appearance of the striation on a branch.
d, transverse section of a dividing branch magnified.
e, external portions of a transverse section magnified.

Plate 4, *figs.* 11, 12.

11. CYSTIPHYLLUM DAMNONIENSE.

a, weathered surface; shewing the irregular central structure.
b, *c*, *d*, transverse sections.
e, longitudinal section, shewing in the largely cystoid central structure an approach to Cyathophyllum.

12. CYSTIPHYLLUM VESICULOSUM.

The specimen was cut both transversely and obliquely, to shew the alternations of large and small vesicular structure.

Plate 5, *fig.* 13.

13 α. STROMBODES HELIANTHOIDES. *Astræa helianthoides.*

a, expanded termination of a short incurved specimen.
b, termination of a smaller specimen.
c, some of the lamellæ, as seen in a section magnified.
d, another example of the lamellæ magnified.
e, a transverse section, shewing the intended central lamellæ magnified.

13 β. STROMBODES VERMICULARIS (?).

a, radiated surface of the cell.
b, magnified lamellæ.

Plate 6, *figs.* 15-17.

15. ASTRÆA PENTAGONA.

The figure shews a transverse section of a cell, with its marginal connexions, magnified.

16 α. ASTRÆA HENNAHII.

a, a specimen slightly decomposed on the surface.

16 β. Variety of A. HENNAHII.

b, natural size, a transverse section.
c, the same magnified.

17. ASTRÆA INTERCELLULOSA.

a, termination of the cells; natural size.
b, magnified transverse section of a cell, and its connexions.
c, appearance on a surface of a lamella passing through the centre.
d, crenulated terminal edges of the lamellæ.

Plate 7, *figs.* 14, 15-18, 19-21.

14. STROMBODES VERMICULARIS.—(Copied from Geol. Trans., 2nd Series, vol. v., p. 58, fig. 7.

a, surface of the coral (worn).
b, section to shew the contorted lamellæ, which by a specimen lately sent to me by Mr. Austen, I find to be very similar to those of *Str. helianthoides*, pl. 5, fig. 13.

15 D. Specimen from the mountain limestone, much allied to *Astræa Hennahii.*

18 E. ACERVULARIA BALTICA. (Wenlock limestone.)

a, union of the stars.
b, enlarged lamellæ and centre.
c, still further enlarged lamellæ, to shew crenulations.

19. PORITES PYRIFORMIS.

a, coral, seen in section of natural size.
b, enlarged view of a part thereof.
c, still more enlarged part. I find that other varieties occur in Devon beside the small-tubed kind, here represented, which is most common, and to which my observations refer.

21. FAVOSITES GOTTLANDICA.

Part of an obliquely compressed specimen.

Plate 8, *figs.* 20, 22, 23.

20. FAVOSITES POLYMORPHA.

a, external surface.
b, internal aspect of a weathered specimen.
c, magnified view of a part thereof.

22. CAUNOPORA RAMOSA.

a, natural size.
b, transverse section magnified.
c, longitudinal section magnified.

23. FAVOSITES SPONGITES. (Polished section.)

Plate 9, *figs.* 24-26.

24. PLEURODICTYUM PROBLEMATICUM.

a, mass shewing the undulated surface of attachment, the walls of the cells, and a vermicular cast in the tubule of some mollusk (?) which had perforated the coral.
b, *c*, views of one of the short prismatic portions, shewing the irregular distribution of the connecting foramina (represented by slender projections on the cast.)—(See also *pl.* 60, *fig.* 24 *a*, *b*.)

25. FAVOSITES FIBROSA.

a, the general plumose aspect of a cylindrical mass split through the middle.
b, *c*, appearances of the prismatic fibres, connecting tubules, and septa (magnified).

26. MANON CRIBROSUM.

a, natural size of a pentagonal-shaped laminar mass.
b, smooth surface.
c, celluliferous or granular surface of a more regular specimen.

Plate 10, *figs.* 27-29.

27. STROMATOPORA POLYMORPHA.

a, mass with weathered surfaces.
b, transverse section of a part magnified.

28. STROMATOPORA CONCENTRICA.

a, transverse section.
b, magnified part of the same.

29. CAUNOPORA PLACENTA.

a, transverse section, natural size.
b, oblique section of a part.
c, longitudinal section of a part.
d, transverse section of a part.

Plate 11, *figs.* 30-33.

30. GORGONIA RIPISTERIA.

a, natural size.
b, magnified surface.

31. MILLEPORA GRACILIS.

a, natural size.
b, magnified surface.

32. MILLEPORA SIMILIS.

a, natural size.
b, *c*, magnified views of the surface.

33. GLAUCONOME BIPINNATA.

a, *b*, natural size.
c, *d*, *e*, magnified views of the reverse, or non-celluliferous face.
f, shews the arrangement of the cells; and
g, somewhat of the disposition of the openings, which are a little oblong, but not clearly seen.

Plate 12, *figs.* 34-36.

34. FENESTELLA LAXA.

a, natural size.
b, magnified reverse.

35 *α*. FENESTELLA ANTIQUA, *var.*

a, specimen of a sub-conical figure, the celluliferous face being external.
b, celluliferous face, indistinctly seen (magnified).
c, reverse surface (magnified).

35 *β*. FENESTELLA ANTIQUA, *var.*

d, natural size of an expanded specimen.
e, the celluliferous face indistinctly seen (magnified).

35 γ. FENESTELLA ANTIQUA, *var.*

f, natural size of small portions.
g, magnified view of the coral, to shew in one part the granular reverse, in another the alternately arranged cells, and, in the hollow left by the removal of the coral, prominences which correspond to the position of the cells.

36. FENESTELLA ARTHRITICA.

a, natural size of an expanded portion near the base.
b, magnified view of the reverse, shewing a peculiar rugosity of surface; and where worn, the internal cells.
c, magnified view of the celluliferous face.
d, greatly magnified view of the reverse.
e, magnified view of the reverse of a variety.

Plate 13, *figs.* 37, 38.

37. RETEPORA PRISCA.

a, natural size.
b, *c*, magnified views of the non-celluliferous face.

38. HEMITRYPA OCULATA.

a, specimen, supposed to be of this species.
b, its external face magnified.
c, a small part (near the attachment) of a large specimen.
d, magnified view of the external face; and
e, the corresponding impression of the internal face.

Plate 14, *figs.* 39, 40.

39. PLATYCRINUS INTERSCAPULARIS.

a, viewed on the basal aspect.
b, on the apex.
c, *d*, on the side; *d*, shewing the interscapular plate.

40. PENTREMITES OVALIS.

a, natural size.
b, magnified.

Plate 15.

41. CYATHOCRINUS MACRODACTYLUS.

a, young individual.
b, middle-aged individual.
c, basal aspect of a third specimen.
d, arm of the specimen, fig. *b*.
e, old example.
f, arm of ditto.
g, a long extended finger of ditto.

Plate 16, *figs*. 42-49.

42. ADELOCRINUS HYSTRIX.

a, *b*, *c*, *d*, the basal surface, seen by the impression it has left.

43. ACTINOCRINUS TRIACONTADACTYLUS (?).

The proboscidal extension.

44-49. CRINOIDAL COLUMNS, *viz.*—

44. ACTINOCRINUS (?) TENUISTRIA.

a, *b*, *c*, three specimens from Linton.
d, *e*, two from Pilton.

45. CYATHOCRINUS (?) PINNATUS.

a, *b*, two specimens from Saunton.
c, *d*, two from Mudstone Bay.

46. CYATHOCRINUS (?) NODULOSUS. (Torquay.)

47. *a*, *b*. CYATHOCRINUS (?) MEGASTYLUS. (Whitesand Bay.)

48. *a*, *b*, *c*. CYATHOCRINUS (?) VARIABILIS. (Pilton.)

49. *a*, *b*, *c*, *d*. CYATHOCRINUS (?) ELLIPTICUS. (South Petherwin.)

d, shews the distant joints.

Plate 17, *figs*. 50-62.

50. PLEURORHYNCHUS MINAX.

a, viewed on the right side.
b, viewed on the anterior end.

51. PLEURORHYNCHUS ALIFORMIS.

a, viewed on the left side.
b, viewed on the anterior end.

52. SANGUINOLARIA SULCATA.

a, *b*, fragments, seen on the side.

53. SANGUINOLARIA ELLIPTICA.

a, natural size.
b, magnified lateral view.
c, a pair of valves, natural size.
d, the same magnified.

54. PULLASTRA ELLIPTICA.

55. PULLASTRA ANTIQUA.

a, impression of the exterior.
b, magnified view of the transverse striæ.

56. PULLASTRA COMPLANATA.

57. CYPRICARDIA SEMISULCATA.

a, *b*, viewed on the right side.
c, magnified part of surface.

58. CYPRICARDIA IMPRESSA.

59. CYPRICARDIA DELTOIDEA.

60. MEGALODUS CUCULLATUS.

61. MYTILUS DAMNONIENSIS.

62. MODIOLA AMYGDALINA.

a, viewed on the lower margin.
b, viewed on the right valve.
c, magnified transverse striæ.

Plate 18, *figs*. 63-67.

63. NUCULA PLICATA.

a, natural size, viewed on the left valve. The plaits on the posterior slope should have been stronger.
b, striation magnified.

64 α. NUCULA LINEATA, *var*.

a, natural size.
b, left valve of a larger specimen.
c, striæ thereon magnified.
d, cast of interior.

64 β. NUCULA LINEATA, *var*.

a, natural size, left valve.
b, striæ magnified.

65. NUCULA OVATA.

66. CUCULLÆA (?) AMYGDALINA.

a, viewed on the hinge.
b, viewed on the lower margin.
c, viewed on the anterior end.
d, viewed on the left valve.

67. CUCULLÆA (?) HARDINGII.

a, right valve.
b, left valve.

Plate 19, *figs*. 67-71.

67. CUCULLÆA HARDINGII.

a, left valve.
b, right valve.

68. CUCULLÆA (?) ANGUSTA.

a, viewed on the hinge.
b, viewed on the right valve.
c, viewed on the posterior end.

69. CUCULLÆA (?) UNILATERALIS.

a, viewed on the right valve.
b, viewed on the hinge.
c, viewed on the left valve.

70. CUCULLÆA (?) TRAPEZIUM.

71. CUCULLÆA (?) COMPLANATA.

a, viewed on the hinge.
b, *c*, right valves, unequally complanate.

Plate 20, *figs*. 72-74.

72. POSIDONIA TUBERCULATA.

a, magnified view of a part of the surface.

73. POSIDONIA BECHERI.

74. POSIDONIA LATERALIS.

a, *b*, young individuals.
c, full-grown specimen.

Plate 21, *figs*. 75-80.

75. PECTEN GRANULOSUS.

a, natural size.
b, *c*, magnified parts of surface.

76. PECTEN POLYTRICHUS.

a, natural size.
b, *c*, parts of surface magnified.

77. PECTEN TRANSVERSUS.

a, natural size, a large specimen.
b, magnified view of parts of the surface.

78. PECTEN ALTERNATUS.

79. PECTEN RUGOSUS.

80. PECTEN ARACHNOIDEUS. The form of the ears is rather dubious.

Plate 22, *figs*. 81-85.

81. PTERINEA SPINOSA.

a, *b*, impressions of the outside.
c, striation of the surface.
d, cast of interior.
e, appearance of exterior.
f, magnified view of a part of the external surface.

82. PTERINEA VENTRICOSA.

83. AVICULA ANISOTA.

84. AVICULA CANCELLATA.

85. AVICULA RUDIS.

Plate 23, *figs*. 86-92.

86. AVICULA SUBRADIATA.

87. AVICULA TEXTURATA.

a, the left valve.
b, magnified surface.

88. AVICULA RETICULATA.

89. AVICULA EXARATA.

a, natural size.
b, magnified.

90. AVICULA DAMNONIENSIS, *var*. ELONGATA.

a, *b*, *c*, different views of the same specimen.

91. *a*, *b*. AVICULA DAMNONIENSIS, *var*. ABBREVIATA.

92. *a*, *b*. AVICULA DAMNONIENSIS, *var*. MEDIA.

Plate 24, *figs*. 93-97.

93. LEPTÆNA ANALOGA.

a, cast of external surface of upper valve, shewing a straight or concave front, (in *L. depressa* it generally *protrudes* in a tongue in the middle.)
b, interior of the upper valve.
c, exterior surface of lower valve.
d, part of the shell removed near the beak of lower valve.
e, *f*, casts of the interior of upper valve.
g, internal surface of lower valve. The interior of the valves much resemble *L. depressa*.

94. LEPTÆNA NODULOSA.

a, lower valve, exterior surface.
b, upper valve, a little distorted.

95. LEPTÆNA RUGOSA.

a, *b*, cast of interior surfaces of the valves (?).

96. LEPTÆNA CONVOLUTA.

97. LEPTÆNA SCABRICULA.

a, upper valve.
b, small rugose lower valve.

Plate 25, *figs*. 98-104.

98. Leptæna caperata.

a, *b*, the lower or convex valve.
c, impressions of the internal plates.
d, the upper or flat valve.

99. Leptæna laxispina (?).

100. Leptæna fragaria.

a, *b*, views of the lower valve.
c, magnified view of a small part.

101 *α*. Leptæna membranacea, *var*.

101 *β*. Leptæna membranacea, *var*.

102. Leptæna mesoloba.

a, natural size.
b, enlarged view of the parts about the hinge.

103. Leptæna interstrialis.

a, lower or convex valve.
b, *c*, upper magnified views of the surface.
d, upper valve.
e, its surface magnified.

104. Orthis sordida.

a, *b*, views of specimens from South Devon.
c, *d*, *e*, views of specimens from North Devon.
f, *g*, enlarged views of the parts about the hinge.

Plate 26, *figs*. 105-112.

105. Orthis longisulcata.

a, *b*, specimens of unequal sizes, obliquely distorted.

106. Orthis interlineata.

a, widest variety, with very round sides, showing the impression of the hinge appendages.
b, a variety considerably less extended transversely.
c, young? magnified at *d*.
e, another young specimen, magnified in *f*.
g, a different variety? magnified in *h*.

107. Orthis arcuata.

a, viewed on the upper valve.
b, viewed on the lower valve.
c, viewed on the hinge.

108. ORTHIS PLICATA.

a, interior.
b, magnified striæ.
c, another specimen.
d, its striæ magnified.
e, cast in the lower valve.

109. ORTHIS PARALLELA.

a, cast of interior.
b, interior surface.
c, exterior surface.
d, magnified striæ thereon.

110. ORTHIS LENS.

a, natural size.
b, magnified striæ.

111. ORTHIS GRANULOSA.

a, *b*, natural size.
c, appearances about the hinge.

112. ORTHIS COMPRESSA.

a, small specimen.
b, impression of a larger specimen.
c, its striæ magnified.
d, part of the flat valve.
e, the convex valve.
f, its striæ magnified.

Plate 27, *figs*. 113-117.

113. ORTHIS CRENISTRIA.

a, specimen shewing the cardinal area and partially closed foramen.
b, striæ magnified.

114. ORTHIS ARACHNOIDEA.

115. ORTHIS RESUPINATA.

a, *b*, *c*, three views of one specimen.
d, its subspinous surface.

116. SPIRIFERA MICROGEMMA.

a, natural size, upper valve.
b, its magnified striæ.

117. SPIRIFERA OBLATA.

Plate 28, *figs*. 117-123.

117. SPIRIFERA OBLATA.

118. SPIRIFERA PROTENSA.

a, natural size
b, striæ on the cardinal area.

119. Spirifera unguiculus.

a, *c*, *d*, views of the lower valve.
b, *f*, views of the upper valve.
e, side view.

120. *a*. Spirifera lineata. Impression of external surface.—(See also *pl.* 58, *fig.* 120.)

120. *b*, *c*, *d*, *e*. Spirifera decussata.

b, impressions of the surface.
d, the shell viewed on the upper valve.
c, *e*, the striæ (crenulated) magnified.

121. Spirifera plebeia.

122. Spirifera hirundo.

a, lower valve.
b, upper valve.
c, viewed on the hinge.

123. Spirifera phalæna.

Plate 29, *figs*. 124-129.

124 *α*. Spirifera simplex.

a, lower valve.
b, cardinal area.
c, cardinal area.
d, lower valve.

124 *β*. Spirifera cuspidata (?).

125. Spirifera heteroclita.

a, *c*, shew the cardinal area and foramen.
b, side view.
d, dorsal view.

126. Spirifera subconica.

a, dorsal aspect.
b, lateral view.
c, ventral aspect.

127. Spirifera distans.

a, dorsal view.
b, viewed on the cardinal area.

128 *α*. Spirifera calcarata.

a, ventral aspect.
b, ribs magnified.
c, dorsal aspect.

128 *β*. SPIRIFERA CALCARATA, *var.*

d, dorsal view.
e, ventral view.

128 *γ*. SPIRIFERA DISJUNCTA.

f, *g*, *h*, different views of the same specimen.

129. SPIRIFERA DISJUNCTA.

a, impression of upper valve.
b, its striation.
c, cast of interior of lower valve.

Plate 30, *figs.* 129-134.

129. SPIRIFERA DISJUNCTA.

130. SPIRIFERA GIGANTEA.

131. SPIRIFERA GRANDÆVA.

a, small pentagonal specimen.
b, larger semi-elliptical specimen.

132. SPIRIFERA OSTIOLATA.

a, large specimen viewed on the lower valve.
b, the foramen under the beak.
c, *d*, specimens of the upper valve.

133. SPIRIFERA APERTURATA.

134. SPIRIFERA COSTATA (?).

a, *b*, *c*, specimens variously distorted.

Plate 31, *figs.* 135-140.

135. SPIRIFERA OBLITERATA.

136. SPIRIFERA RUDIS.

a, *b*, *c*, three specimens of the natural size.

137. SPIRIFERA MESOMALA.

a, natural size.
b, magnified.

138 *α*. SPIRIFERA NUDA.

a, upper valve.
b, *c*, sketches to shew the foramen, &c.

138 *β*. SPIRIFERA NUDA (?).

d, viewed on the ventral face.
e, lateral view.

139. SPIRIFERA ROTUNDATA (?).

a, dorsal aspect.
b, viewed on the hinge.

140. SPIRIFERA MEGALOBA.

a, dorsal aspect.
b, to shew the cast of the interior of the beak of the lower valve.

Plate 32, *figs*. 141-143.

141. STRIGOCEPHALUS BURTINI.

a, viewed on the upper valve, full-grown.
b, similar view of a specimen with narrow foramen.
c, lateral view, to shew the form of the beak.

142. STRIGOCEPHALUS GIGANTEUS.

a, view of a cast of the interior, the outline partly completed.
b, interior structure, upper valve.
c, reverse of *a*, part of the shell remains.

143. STRIGOCEPHALUS BREVIROSTRIS.

a, shews the internal structure, lower valve.
b, a smaller specimen, seen on the upper valve.

Plate 33, *figs*. 144-147.

144. TEREBRATULA (ATRYPA) ASPERA.

a, the upper valve.
b, the lower valve.
c, seen on the hinge line.
d, lateral outline.

145. TEREBRATULA (ATRYPA) PRISCA, (large variety.)

a, lower valve.
b, upper valve. These sketches are intended only to shew the general figure and direction of the striæ.

146. TEREBRATULA (ATRYPA) DESQUAMATA.

a, full-grown, (with round foramen ?).
b, *c*, young, the foramen touching the hinge line, as in Strigocephalus.
d, side view.
e, *g*, interior of upper valve.
f, interior of lower valve.
h, cast of interior of lower valve.

147. TEREBRATULA (ATRYPA) INSPERATA.

Impression of outer surface of upper valve and beak of lower valve.

Plate 34, *figs.* 148-154.

148. TEREBRATULA (ATRYPA) CASSIDEA.

a, lateral view.
b, ventral view.
c, dorsal view.

149. *a*, *b*. TEREBRATULA PROBOSCIDALIS.

150. TEREBRATULA CUBOIDES.

151. *a*, *b*. TEREBRATULA BIFERA.

152. *a*, *b*, *c*. TEREBRATULA CRENULATA.

153. TEREBRATULA LATICOSTA.

a, *b*, full-grown.
c, young of the same form.
d, *e*, young of a different form.
f, the striation on the plaits.

154. TEREBRATULA ANISODONTA.

a, *c*, seen on the front.
b, dorsal aspect.

Plate 35, *figs.* 155-168*.

155. *a*, *b*. TEREBRATULA PLEURODON.

156. TEREBRATULA PUGNUS.

a, *b*, *c*, variety common in the mountain limestone.
d, *e*, a smaller neat variety.

157. TEREBRATULA RENIFORMIS.

Variety with small obtuse mesial plaits.

158. *a*, *b*. TEREBRATULA RHOMBOIDEA.

159. TEREBRATULA ACUMINATA.

One of the many varieties of this inconstant shell.

160. TEREBRATULA AMBLYGONA.

161. TEREBRATULA COMTA.

a, closely resembles *Terebratula radialis* of mountain limestone.
b, *c*, *d*, larger variety, with bold mesial elevation.

162. *a*, *b*, *c*, TEREBRATULA ANGULARIS.

163. TEREBRATULA FERITA.

a, *b*, larger variety, with beak a little elongate.
c, small variety, a little asymmetrical.

164. TEREBRATULA SUBDENTATA.

165. *a*, *b*, *c*. TEREBRATULA JUVENIS.

166. TEREBRATULA SACCULUS.

167. TEREBRATULA VIRGO.

168. *a*, *b*. TEREBRATULA HASTATA (?).

In *a* the beak is broken, not perforated with a round foramen.
b shews somewhat of the internal structure.

168*. Indeterminate species of TEREBRATULA.

Plate 36, *figs*. 169-174*.

169. ACROCULIA VETUSTA.

a, shews the obliquely spiral apex.
b, the expanding side of the shell (in a large variety).
c, the obliquely of the figure.

170. ACROCULIA SIGMOIDALIS.

171. EUOMPHALUS CIRCULARIS.

172. EUOMPHALUS SERPENS.

a, *b*, largest examples seen.
c, *d*, *e*, the smallest.
f, *g*, these have a different aspect from the rest.—(See *pl*. 58, *fig*. 172, and *pl*. 60, *fig*. 172*.

173. NATICA MERIDIONALIS.

174. NATICA NEXICOSTA.

b, enlarged striæ.

174*. Some other species of NATICA undetermined.

Plate 37, *figs*. 175-181.

175. TURBO TEXATUS.

a, natural size.
b, enlarged surface.

176. PLEUROTOMARIA CANCELLATA.

a, small specimen.
b, its surface enlarged.
c, large example.
f, its magnified surface.

176 *d*. PLEUROTOMARIA ANTITORQUATA.

d, sinistral shell.
e, its band and cancellation magnified.

177. PLEUROTOMARIA ASPERA.

a, *b*, *var*. α, part of the surface enlarged in *b*, shewing the angular bordered band.
c, *d*, *var*. β, (old) shewing the broad rounded band; *d*, enlargement of a part of the surface above the band.

177*. Perhaps a cast of the above species.

178. Pleurotomaria monilifera.

179. Pleurotomaria expansa.

180. Pleurotomaria impendens.

181. Pleurotomaria gracilis.

180*. Undetermined—closely resembles *Trochus helicites*, Sil. Res., *pl.* 3, *fig.* 5.

Plate 38, *figs.* 182-188.

New Genus.—Loxonema. (Melania, Terebra, Rissoa, &c. of different Authors.)

182*. Probable form of the mouth in some of the species.

182. Loxonema sinuosa.

183. Loxonema nexilis.

a, *c*, two specimens of the usual size and appearance.
b, magnified suture (the dots are too strong.)

184. *a*, *b*. Loxonema Hennahiana, (from Mr. Sowerby.)

185. *a*, *b*. Loxonema lincta.

186. *a*, *b*, Loxonema tumida.

b, enlarged surface.

187. *a*, *b*, *c*. Loxonema (?) præterita.

188. Loxonema rugifera.

Plate 39, *figs.* 189-197.

189. Murchisonia angulata.

190. Murchisonia geminata.

191. Murchisonia bilineata (?).

The small figure shews its double linear band.

192. Murchisonia spinosa.

a, elongate well-spined variety.
b, *c*, shorter, older, less spinose on the lower whorls.

193. Macrocheilus (?) brevis.

194. Macrocheilus (?) imbricatus.

a, specimen of the shell shewing the striation.
b, supposed to be a cast of the interior.

195. Macrocheilus elongatus.

196. *a*, *b*. MACROCHEILUS NEGLECTUS.

197. MACROCHEILUS (?) HARPULA, (*Murex harpula* of Sowerby), referred to by Bronn as *Nerita subcostata* of Goldfuss.

Plate 40, *figs*. 198-203.

198. BELLEROPHON STRIATUS.

a, shews the lunate aperture.
b, the umbilicus.

199. BELLEROPHON URII.

a, lateral striation.
b, dorsal striation.
c, *d*, magnified striation; *d*, being mesodorsal.

200. BELLEROPHON TRILOBATUS.

a; *b*, *c*; *d*, *e*; three varieties from different places.

201. BELLEROPHON WOODWARDII.

a, view on the disc.
b, on the dorsal line.

202. BELLEROPHON GLOBATUS.

a, *b*, *c*, natural size.
d, *e*, *f*, magnified.

203. BELLEROPHON WENLOCKENSIS (?).

a, *b*, two specimens of unequal size.

Plate 41, *figs*. 204, 205.

204. *a*, *b*, *c*. ORTHOCERAS CINCTUM. (?)

a, seen on a broad face.
c, on a narrower face.
b, face of a septum, and a line below to shew its very slight obliquity.

205. *a*, *b*, *c*, *d*. ORTHOCERAS LATERALE.

a, seen laterally, the shell removed.
b, part of the shell remaining near the termination, (there are no lines on the shell or the cast.)
c. *d*, small elongated specimens.
e. cross section.

Plate 42, *figs*. 206, 207.

206. *a*, *b*, *c*. ORTHOCERAS LUDENSE.

a, part of a large specimen.
b, shews the nearly central siphuncle, tumid between the septa (Ormoceras of Stokes.)
c, the face of a septum, the siphuncle being excentric on the conjugate axis.

Plate 43, *figs*. 208-213.

208. *a*, *b*. Orthoceras ibex.

209. *a*, *b*. Orthoceras lineolatum. (*O. annulatum* of mountain limestone.)

210. *a*, *b*, *c*, *d*, *e*. Orthoceras tentaculare.

a, *b*, casts of interior; *a* shewing the distant septa.
c, the investing shell and part of the cast.
d, enlarged view of shell.
e, to shew the retral flexure of the annulations.

211. Orthoceras tubicinella.

212. Orthoceras striatulum.

213. *a*, *b*, *c*. Orthoceras cylindraceum.

a, in section, shewing the large central siphuncle (not swollen between the septa.)
b, also in section, shewing the deep curve of the septa, and the nearly cylindrical figure.
c, a specimen which shews circular striæ. It is perhaps distinct.

Plate 44, *figs*. 214-216.

214. Cyrtoceras fimbriatum.

a, to shew the curvature and the septa.
b, ventral view of the surface.

215. Cyrtoceras tredecimale.

a, dorsal aspect.
b, ventral aspect.
d, lateral view.
e, cross section.

216. Cyrtoceras quindecimale.

a, to shew the curvature and character of surface.
b, cross section.

Plate 45, *figs*. 217, 218.

217. Cyrtoceras ornatum.

218. Cyrtoceras obliquatum.

a, ventral aspect.
b, lateral view to shew curvature.
c, a diagram to shew the nature of the obliquity.
d, *e*, striation.

Plate 46, *figs*. 219-222.

219. Cyrtoceras marginale.

a, chamber seen on the face.
b, on the edge.

220. CYRTOCERAS NAUTILOIDEUM.

a, to shew the curvature.
b, ventral aspect (both casts.)

221. CYRTOCERAS NODOSUM.

222. CYRTOCERAS RUSTICUM.

a, ventral aspect.
b, lateral aspect.
c, dorsal aspect.

169*. This figure was first supposed to represent an ACROCULIA. On opening the dorsal line, what was supposed to be siphuncular structure was discovered, but the imperfection of the specimen renders it uncertain whether it be not the impression of a part of some Crinoid.

Plate 47, *fig*. 223.

223. CYRTOCERAS BDELLALITES.

a, to shew the not unusual curvature, and subdorsal siphuncle.
b, to shew an oblique section.

Plate 48, *figs*. 224-227.

224. CYRTOCERAS RETICULATUM.

a, dorsal aspect.
b, striation.
c, lateral aspect.
d, section of part of a whorl.

225. CYRTOCERAS ARMATUM.

a, to shew the lateral aspect and curvature.
b, dorsal aspect.
c, cross section, shewing the prominence of the tubercles.

226. NAUTILUS GERMANUS. (Compare to *N. sulcatus*, &c.)
a, lateral face.
b, cross section, shewing a very round back.

227. NAUTILUS MEGASIPHO.

a, to shew the aperture and siphon.
b, lateral view.
c, striation.

Plate 49, *figs*. 228-230.

228. GONIATITES INSIGNIS.

a, seen on the disc.
b, the septum.

229. GONIATITES LINEARIS.

a, b, specimen agreeing quite with the specific type.
c, d, specimen apparently very closely resembling *Gon. ovatus* (Munster.)

230. GONIATITES BIFERUS.

a, shews the striation and also the septa (imperfectly).
b, the septum traced with care.

Plate 50, *figs.* 231-234.

231. GONIATITES GLOBOSUS.

a, imperfect specimen, shewing the side aspect.
b, section of the volutions.

232. GONIATITES EXCAVATUS.

a, on the side.
b, to shew the dorsal aspect. The striation is not preserved.

233. GONIATITES SPIRALIS.

a, d, side views.
f, an impression, with a central young shell magnified.
e, g, the septum.
b, c, surface magnified.

234. GONIATITES CRENISTRIA.

a, side view of a cast of the interior, shewing septa.
b, septum.
c, shell viewed on the dorsal aspect.
d, small example with the striation, which is magnified in *g.*
e, f, a young individual.

Plate 51, *figs.* 235-238.

235. GONIATITES MIXOLOBUS.

a, usual character of an impression or compressed shell.
b, to shew the septa in the best state of conservation.
c, d, e, magnified views of septa, as well as can be traced.
f, a small uncompressed shell, in which the septa are magnified in *g.*

236. GONIATITES SPIRORBIS (?).

a, b, c, d, different examples; the septum is not clearly traceable.

237. GONIATITES SERPENTINUS (?).

238. GONIATITES INCONSTANS.

a, large specimen shewing the carination.
b, striation, when clearly traced.
c, dorsal aspect of a middle-sized shell.
d, young shell, with the constrictions seen (not septa).
e, young shell, to shew the wide calyciform umbilicus.

Plate 52.

239. *a*, *b*, *c*. **Clymenia lævigata.**

a, one of the largest specimens seen.
b, cross section of volutions.
c, the dorsal striæ retroflexed, and the septum broadly waved forward.

Plate 53, *figs*. 240-242.

240. *a*, *b*. **Clymenia striata**, *var*. **costellata.**

a, specimen from which the shell is mostly removed, shewing the septa.
b, the septum, similar in form to some others of this group.

241. *a*, *b*. **Clymenia linearis.**

a, much of the shell remaining on the specimen.
b, shews the fine linear keel.

242. *a*, *b*, *c*, *d*. **Clymenia fasciata.**

a, the general figure and depth of septal cavity.
b, cross section to shew the band.
c, the band striated across.
d, the septal curve.

Plate 54, *figs*. 243-245.

243. *a*, *b*, *c*. **Clymenia sagittalis.**

a, the discoid surface.
b, septum (narrowly waved).
c, cross section.

244. *a*, *b*, *c*. **Clymenia plurisepta.**

a, shews the frequent septa and general form.
b, the cross section.
c, the septum.

245. *a*, *b*. **Clymenia valida.**

a, the general figure and striation.
b, the septum.

Plate 55, *figs*. 246, 250, 252.

246. **Harpes macrocephalus.**

250. **Calymene lævis.**

a, *b*, specimens shewing the abdominal segments.
c, *d*, *e*, specimens shewing the cephalo-thorax.

252. **Asaphus.**

Plate 56, *figs*. 247-249, 251.

247. **Calymene Sternbergii.**

248. CALYMENE GRANULATA.

a, *b*, *c*, *d*, *e*, *f*, *g*, *h*, views of the cephalo-thorax from above.
i, *k*, views of the edge of the labrum from beneath.
l, *m*, *n*, *o*, *p*, views of the post-abdomen, shewing it to be less obtuse or subtruncate than in *Calym. parallela.*

249. CALYMENE LATREILLII.

a, *b*, cephalo-thorax seen from above.
c, the post-abdomen.

251. ASAPHUS GRANULIFERUS.

Plate 57, *figs.* 253-255.

253. HOMALONOTUS.

a, impression of exterior.
b, *c*, parts of the abdominal rings, near the cephalothorax (casts of interior.)
d, portion resembling *H. Herschelii.*
e, small fragment of a ring.

254. BRONTES FLABELLIFER.

a, *c*, the general character.
b, enlarged portion, shewing (rarely) a tubular character to the tubercles.

255. BRONTES SIGNATUS.

256. Scale of HOLOPTYCHUS.

257. Scale (?) of another species.

Plates 58, 59, 60, *are Supplementary Plates, for the purpose of including figures of objects not received in time to be placed in the egrular order.*

Plate 58.

39*. Joint of PLATYCRINUS.

49*. *a*, *b*. Joint of a CRINOID, from Coddon Hill, CYATHOCRINUS DISTANS.

53. SANGUINOLARIA ELLIPTICA.

53*. SANGUINOLARIA LIRATA.
b, magnified.

65*. NUCULA LATISSIMA.

98. LEPTÆNA CAPERATA, JUN.

98*. LEPTÆNA, probably new species.

104*. ORTHIS HARDRENSIS.
a, specimen from Westleigh, in North Devon.
b, *c*, from Hardrow, in Yorkshire.
d, the striation.

112*. (Lower figure) ORTHIS SEMICIRCULARIS.

112*. (Upper figure) ORTHIS CALCAR. The figure should have had two asterisks.

118*. Compare with ATRYPA TUMIDA (?). *Dalman.*

120*. *a*, *b*. SPIRIFERA LINEATA.

134*. SPIRIFERA SPECIOSA.

a, seen on the front.
b, on the upper valve.

172. EUOMPHALUS SERPENS.

203*. *a*, *b*. BELLEROPHON (?) HIULCUS.

213*. ORTHOCERAS.

246*. Part of some TRILOBITE.

249*. CALYMENE.

258. CTENODUS (?). (Babbacombe).

259. Unknown. (From Trescot).

Plate 59.—SPHÆRONITES TESSELLATUS. (The figures are copied from Geol. Trans., New Series, vol. iii., *pl.* 20.)

Plate 60. (From Mr. Austen's collection.)

24. *a*, *b*. Specimen of PLEURODICTYUM PROBLEMATICUM.

Shewing the striation and subreticulated impressions of the surfaces of the sub-pyramidal parts, represented in the state of casts, from inferior specimens, on *pl.* 9, *fig.* 24 *b*, *c*.

39*. PLATYCRINUS TUBERCULATUS (?).

Several specimens have been examined, none very perfect, but sufficiently so to determine their affinities.

39**. PLATYCRINUS PENTANGULARIS (?).

The divisions of the pelvis are not traceable, as far as can be seen. *Adelocrinus hystrix* is probably allied to this.

41*. CYATHOCRINUS GEOMETRICUS.

51. PLEURORHYNCHUS ALIFORMIS. (See also *pl.* 17, *fig.* 51.)

The dotted lines are given to complete the figure.

60*. MEGALODUS CARINATUS.

a, side view.
b, anterior end.

62*. MODIOLA SCALARIS.

80*. PECTEN PLICATUS.

102*. CALCEOLA SANDALINA (reduced from a sketch by Mr. Austen).
The specimens at Chircombe Bridge are usually larger; and there appears some diversity of form among them.

104*. ORTHIS HARDRENSIS.
Interior of the flatter valve minutely punctated.

124 *a*. SPIRIFERA SIMPLEX. (See also *pl.* 29, *fig.* 124 *a*.)

148*.
This shell, the only one I have seen, has an obvious analogy to *Atrypa galeata*, (Dalman;) but its want of radiating furrows and more elongate figure seem to distinguish it. The front is depressed as in *A. tumida*.

171*. EUOMPHALUS RADIATUS (?).
It does not, however, shew the retroflexed sharp striæ on the inner part of the whorl.

172*. EUOMPHALUS ANNULOSUS. (Compare *pl.* 36, *fig.* 172 *a*, *b*.)

187*. LOXONEMA RETICULATA.

190*. MURCHISONIA TRICINCTA. (Compare *M. geminata*, *pl.* 39, *fig.* 190.)

194*. MACROCHEILUS ARCULATUS (?). (Compare *M. imbricatus*, *pl.* 39, *fig.* 194, and Geol. of Yorkshire, *pl.* 16, *figs.* 9, 10, 17).

205*. ORTHOCERAS VENTRICOSUM.

227*. GONIATITES TRANSITORIUS. Compare *Gon. Dannebergi* (Beyrich), *pl.* 165, and *Gon. expansus* (Von Buch), *Gon. hybridus*, (Munst.), *pl.* 3, *fig.* 5).

232. Septum of GONIATITES EXCAVATUS. (From Newton).
Externally similar in figure to *Goniatites truncatus* (Phillips), and to *Goniatites globosus* (Munst.), but by this form of septum different from both.

THE END.

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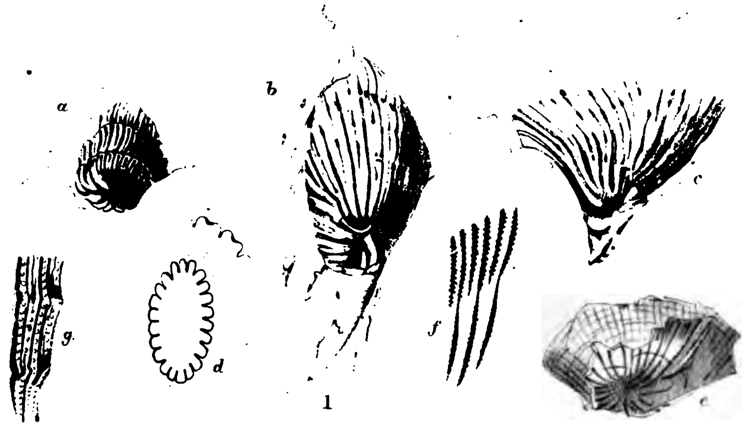
Pl. 1.



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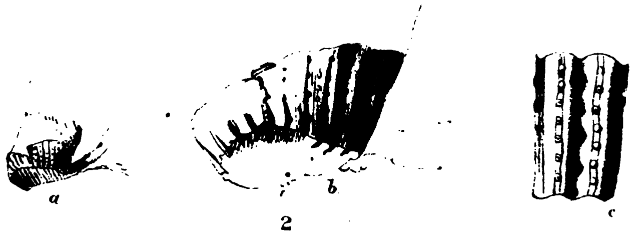

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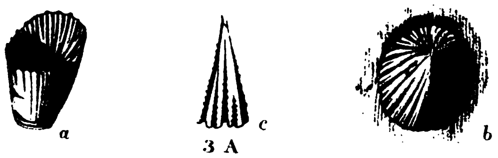

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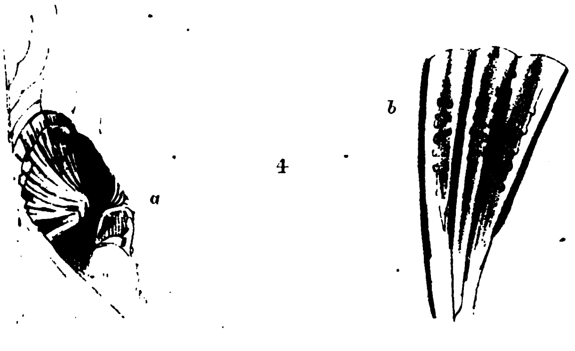

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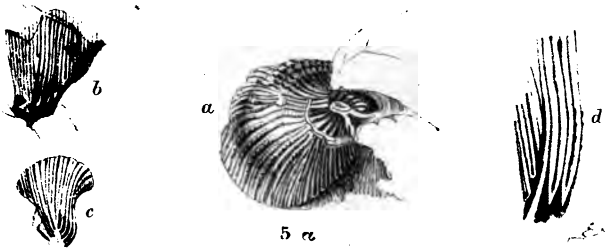

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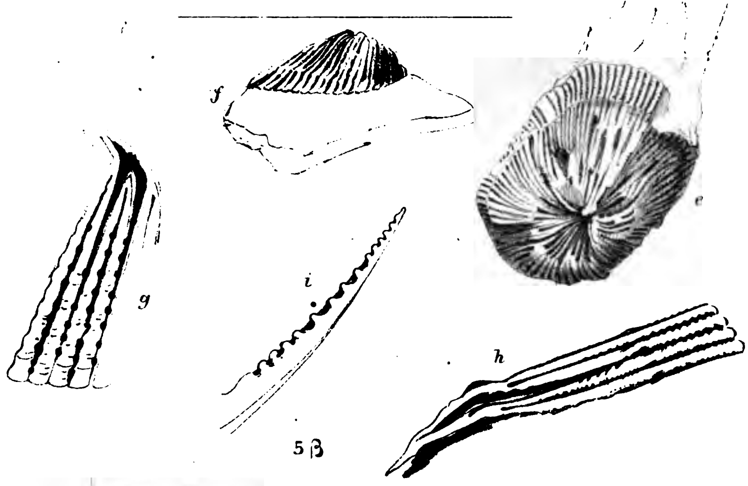

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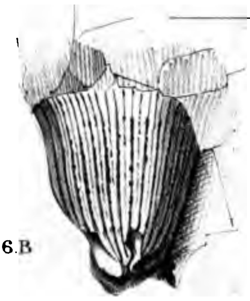

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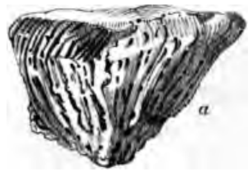

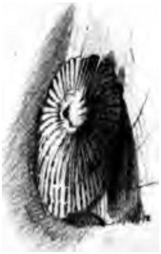

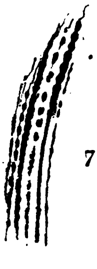

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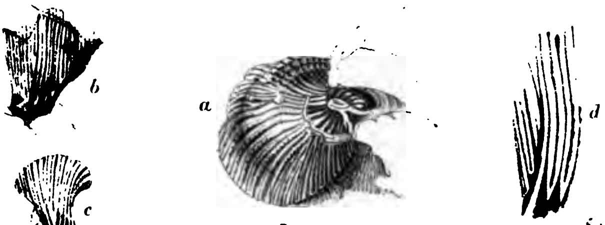

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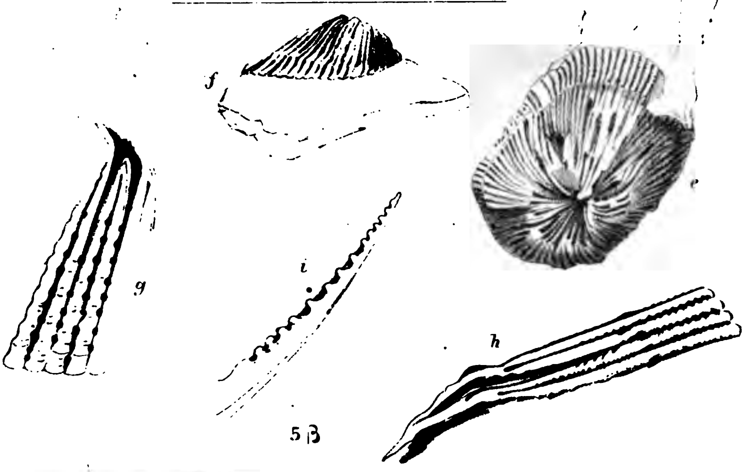

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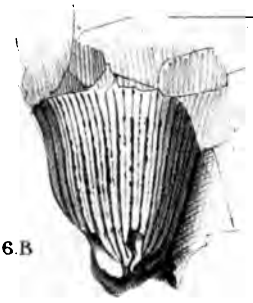

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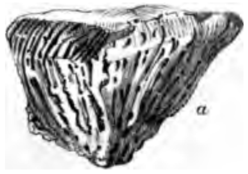

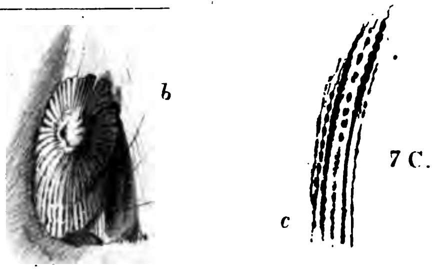

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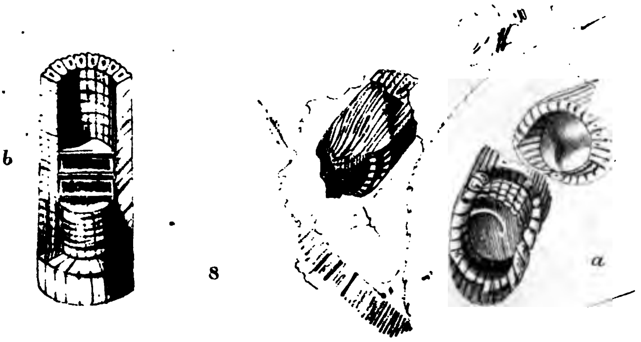

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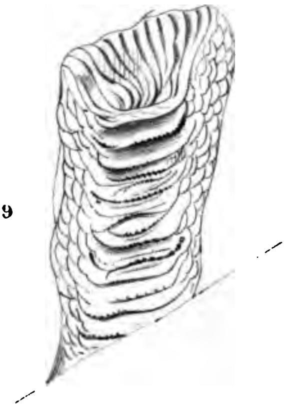

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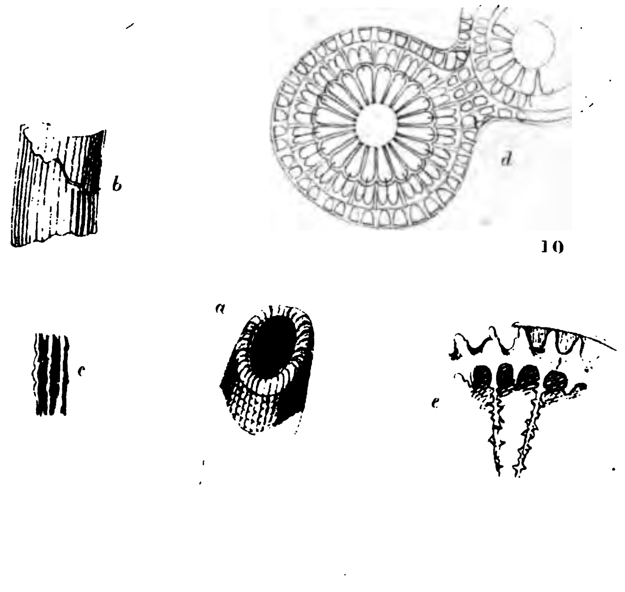

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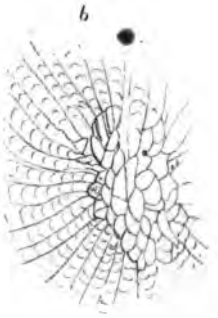

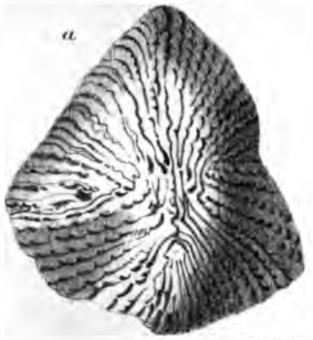

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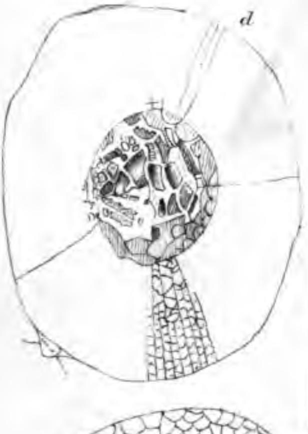

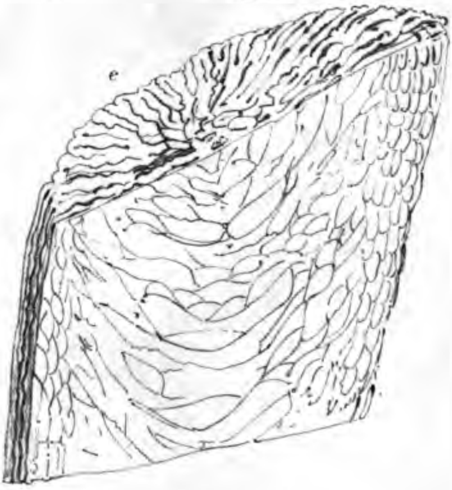

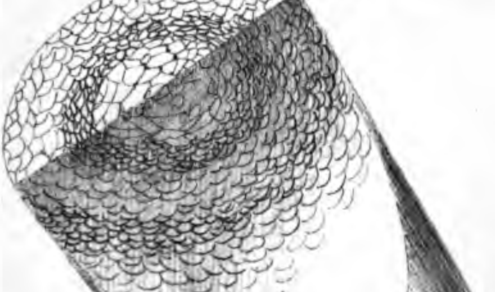

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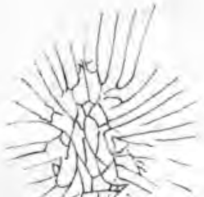

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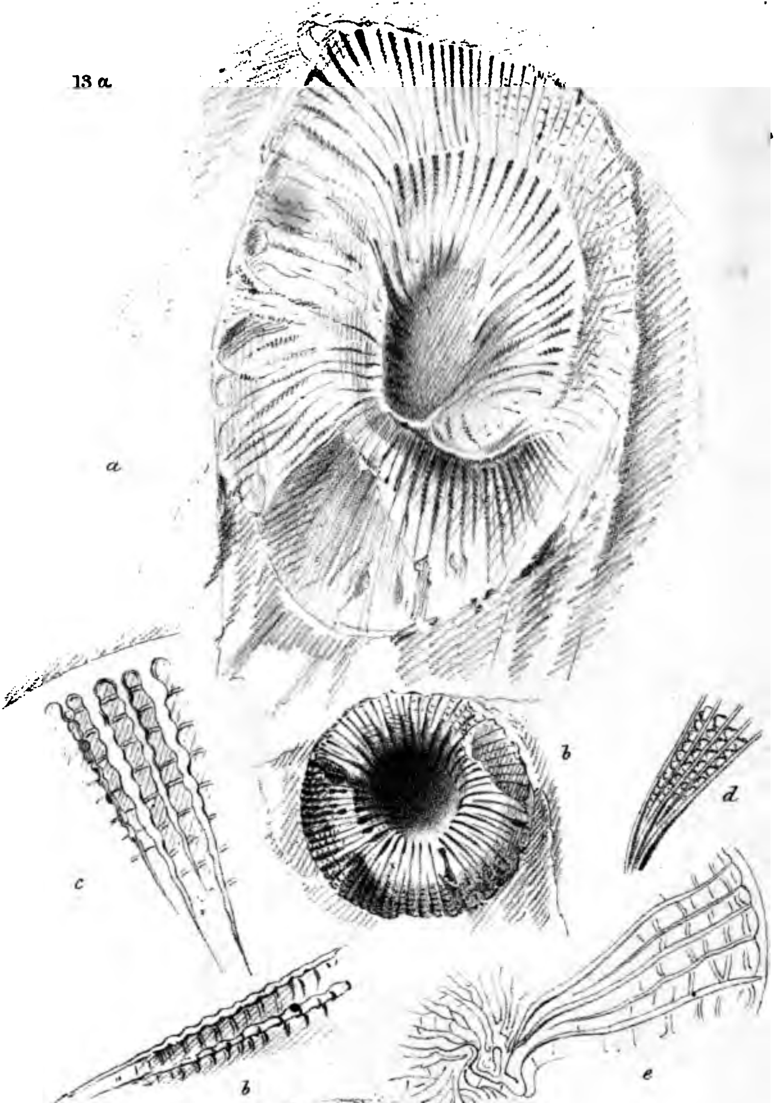

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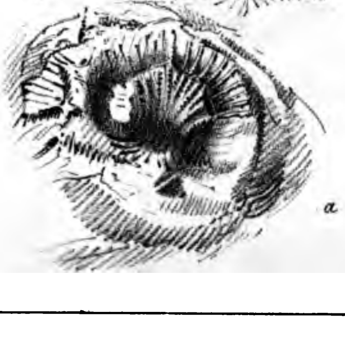

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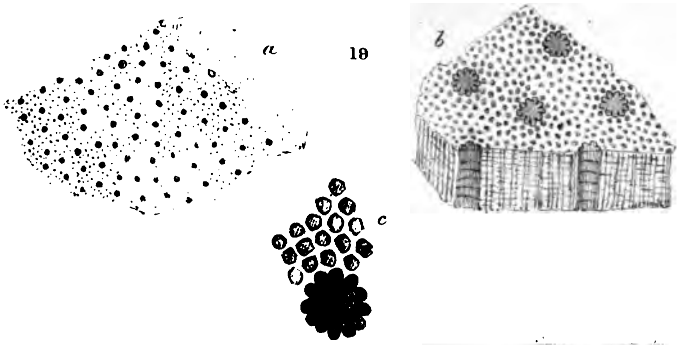

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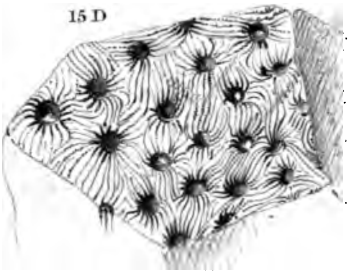

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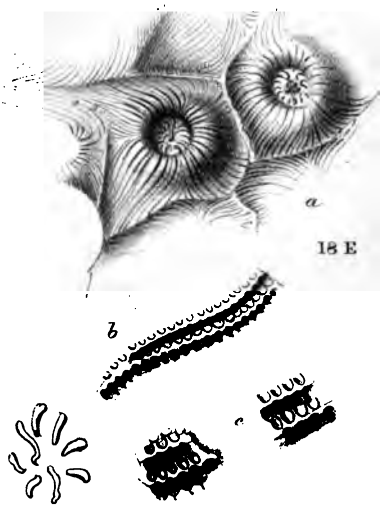

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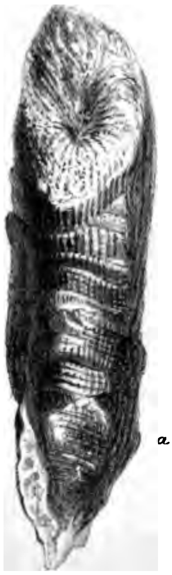

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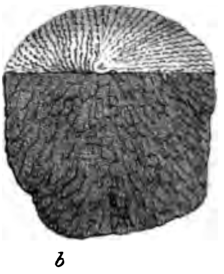

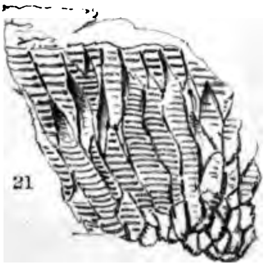

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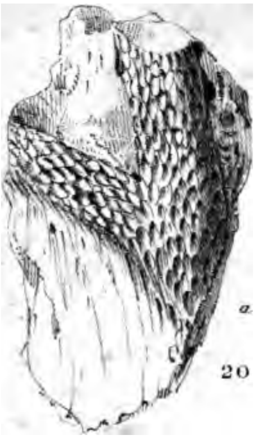

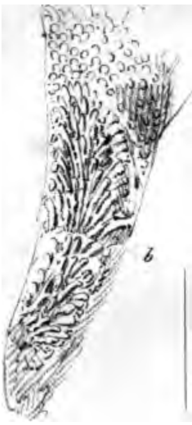

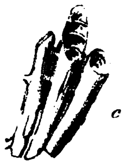

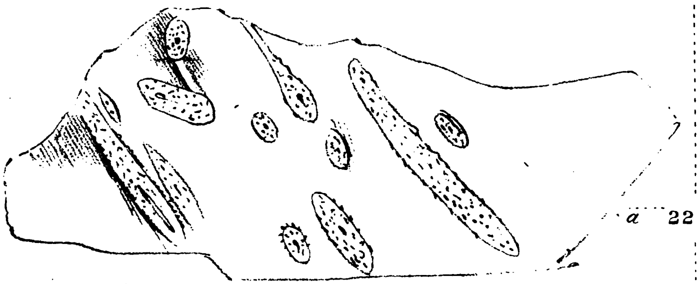

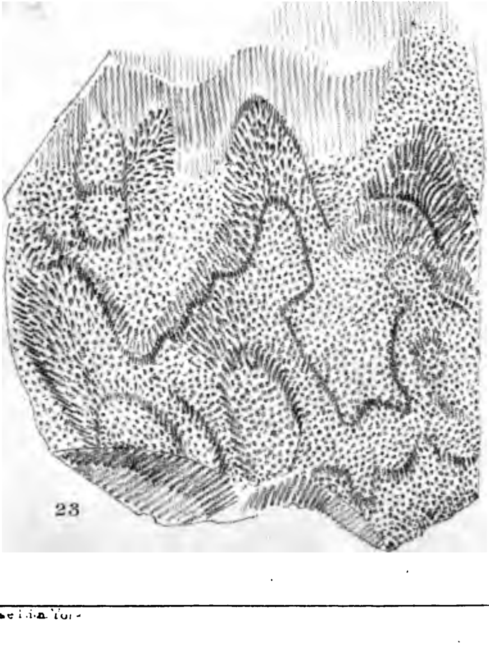

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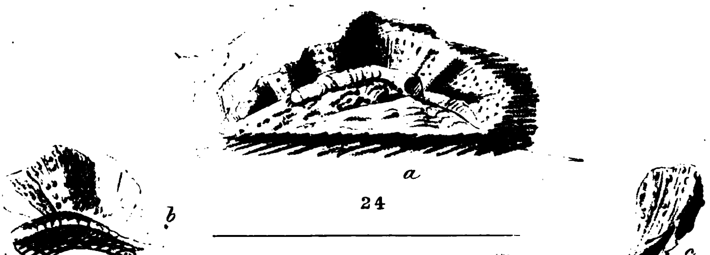

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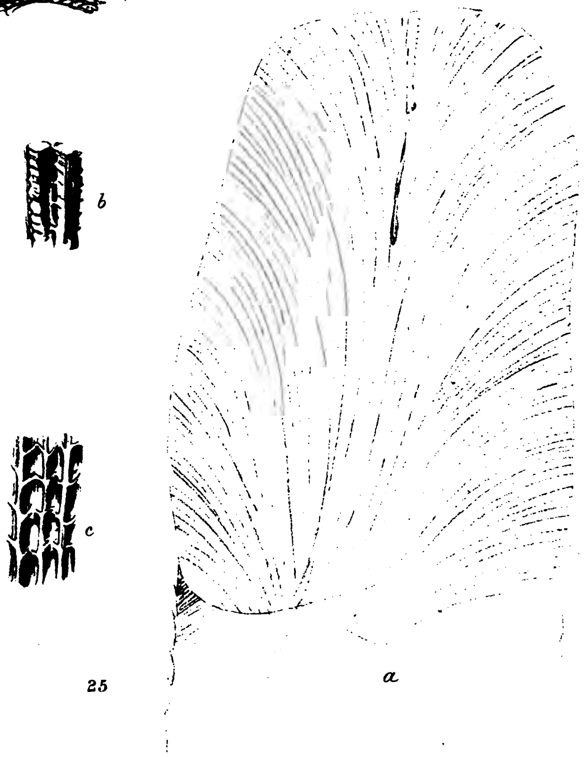

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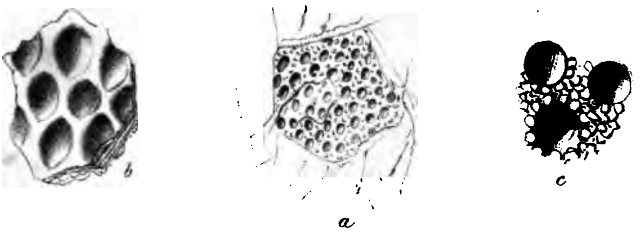

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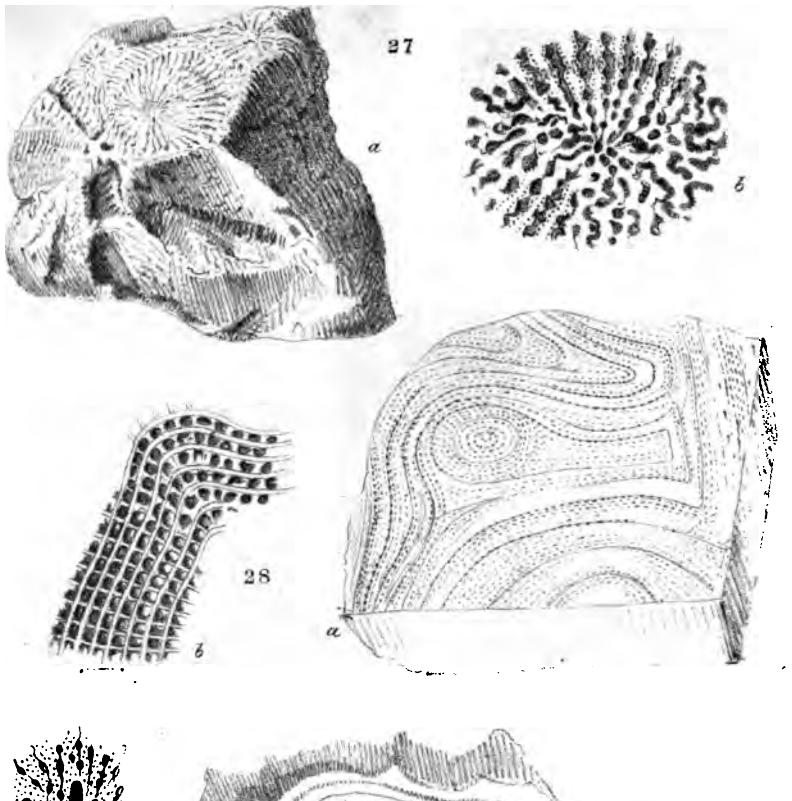
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29
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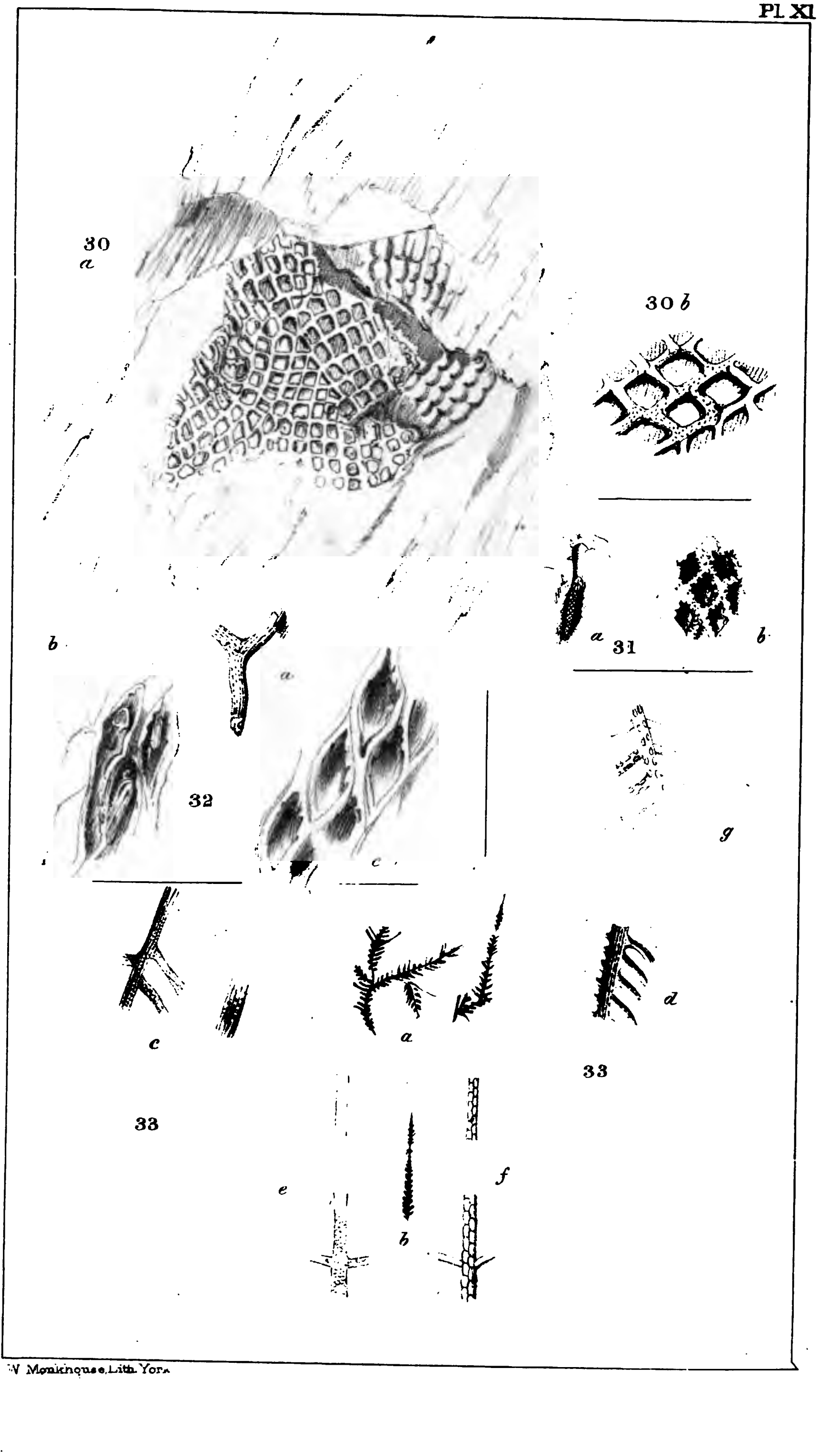

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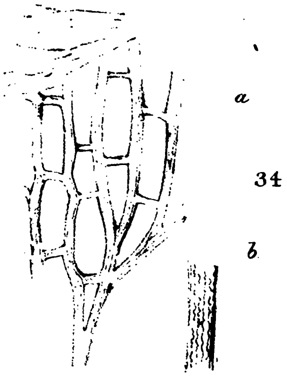
Pl. XII



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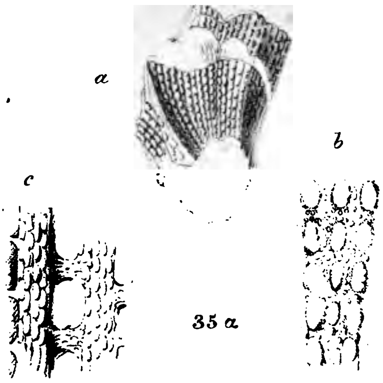

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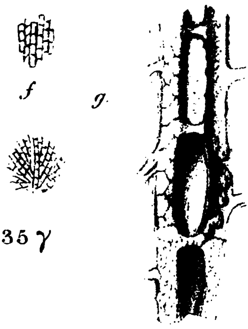

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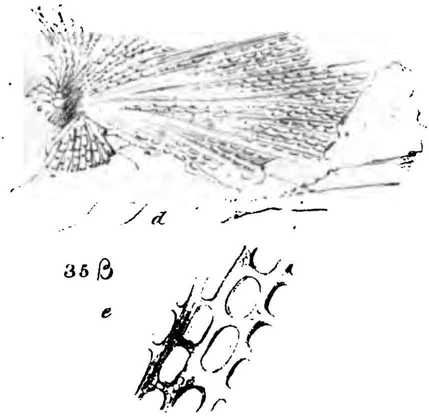

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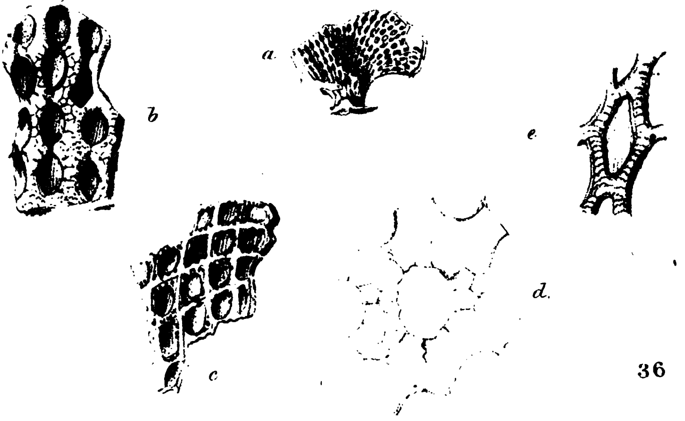

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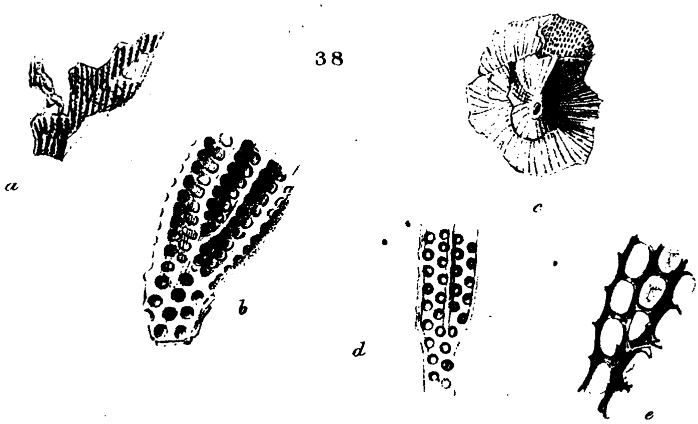

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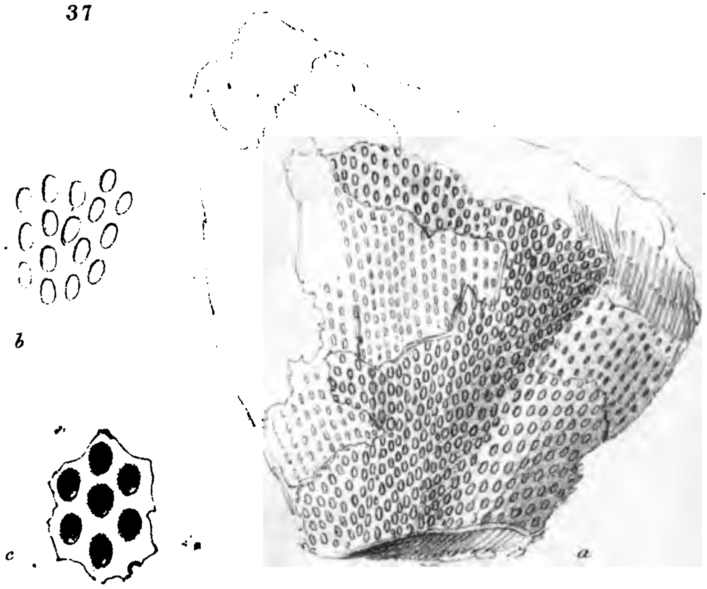

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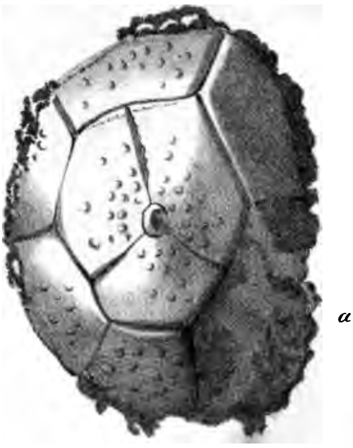

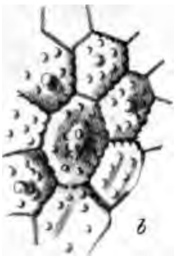

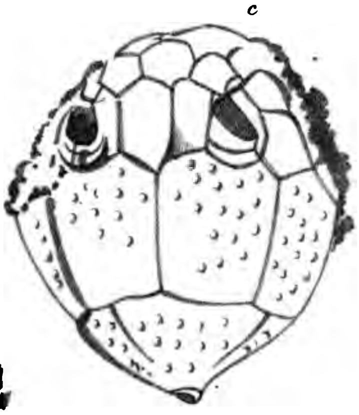

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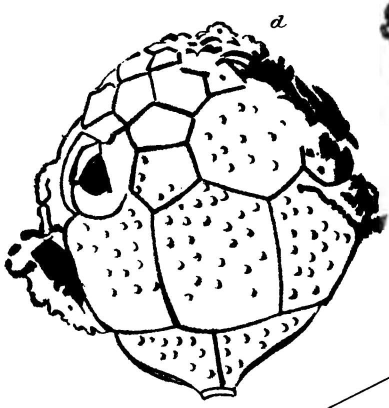

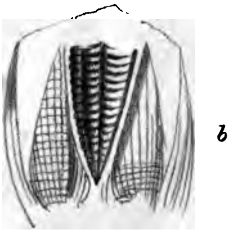

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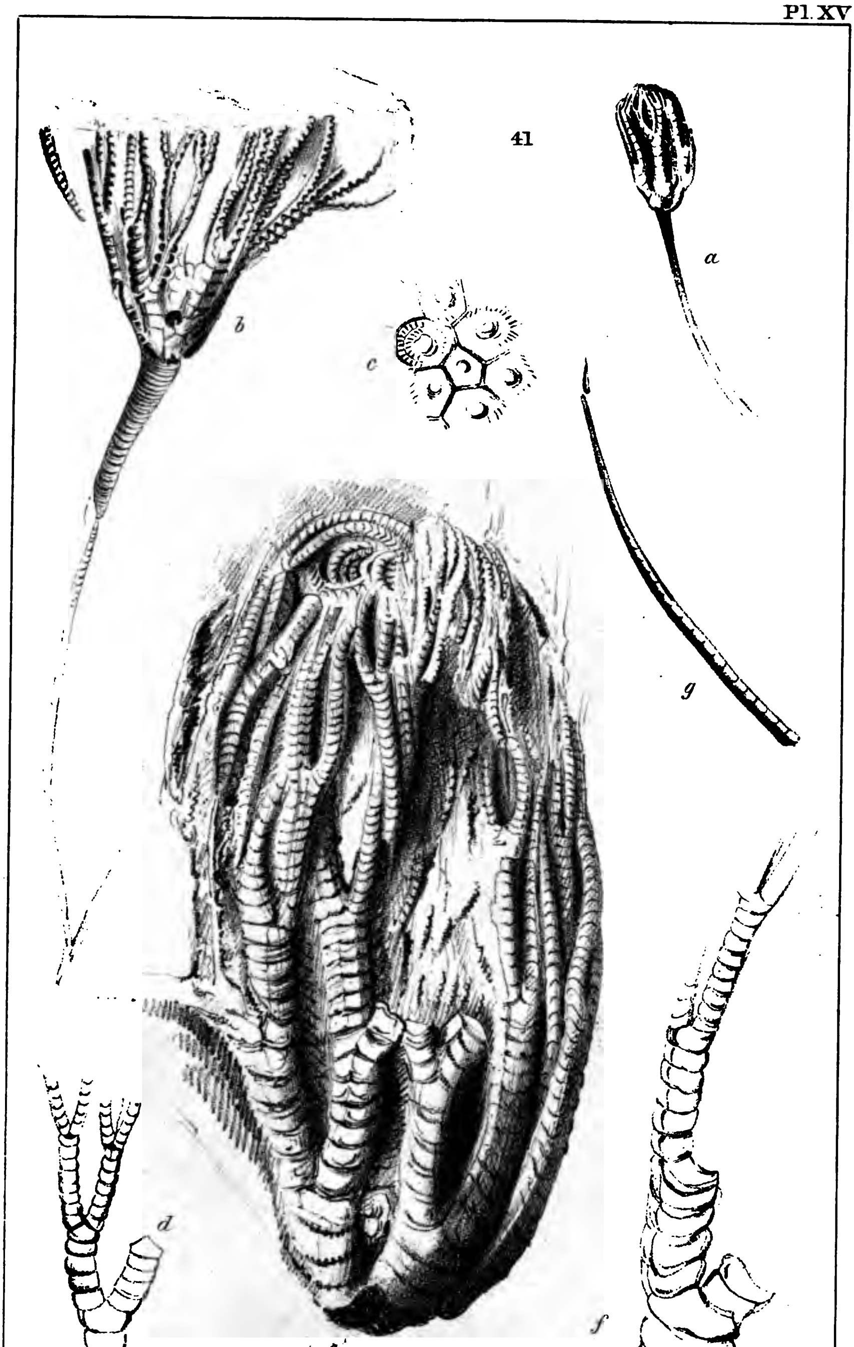

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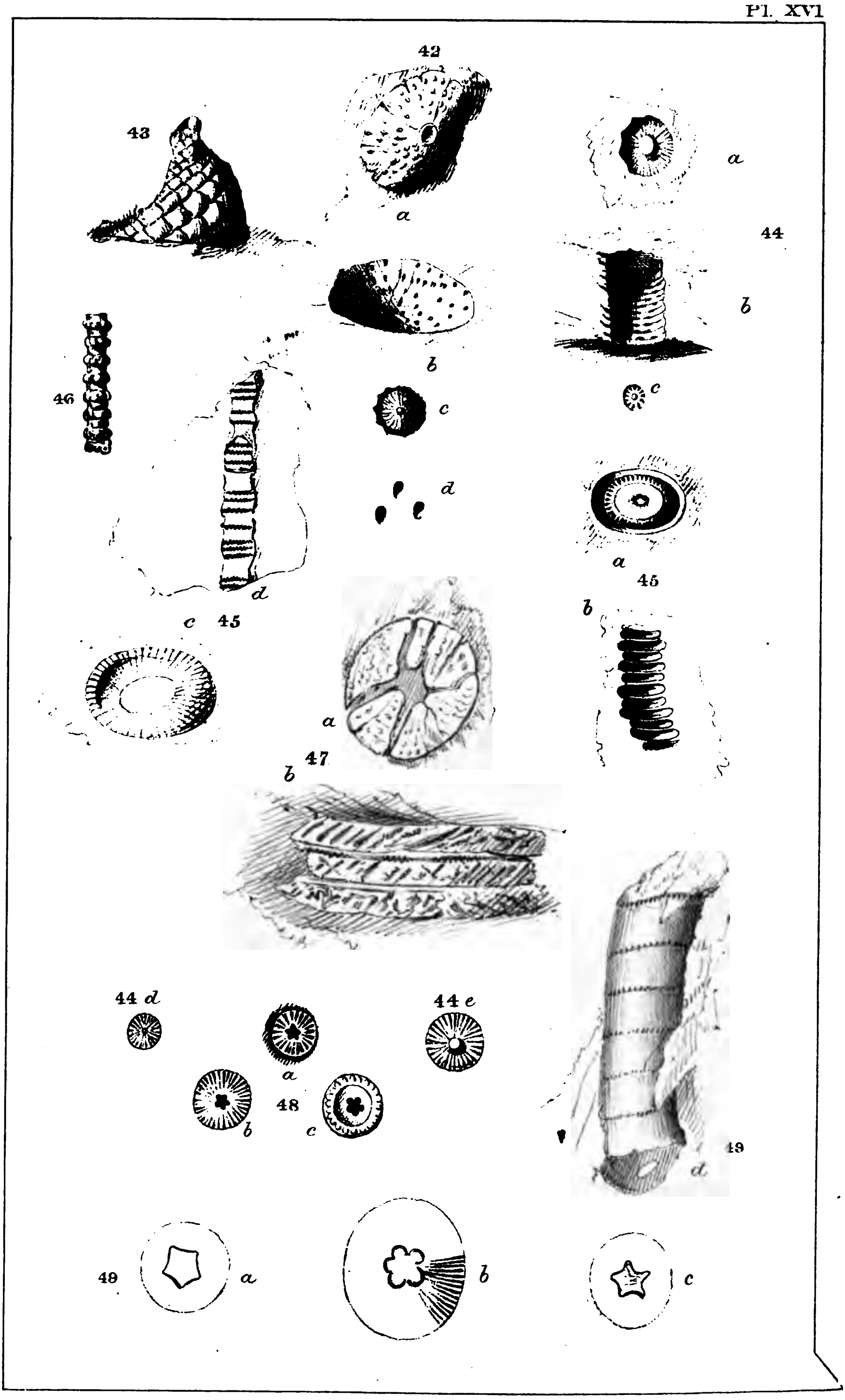

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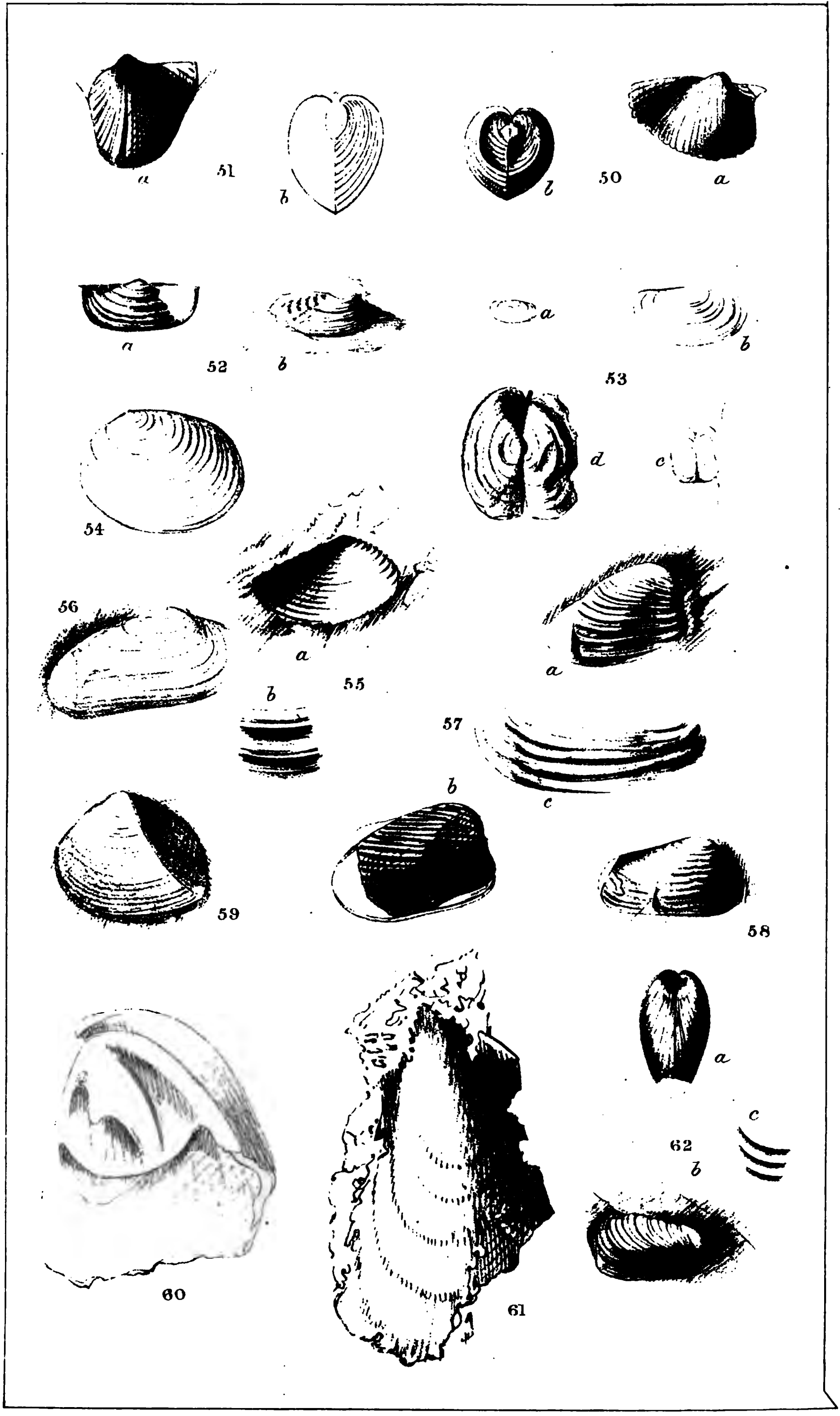
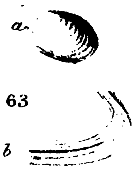
C. meniaux 50, fig 33.

Pl. XVII





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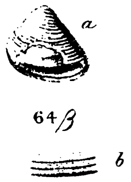

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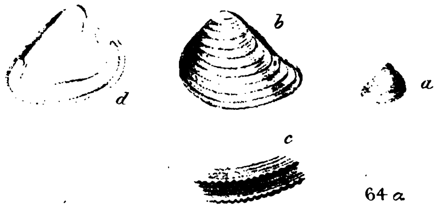

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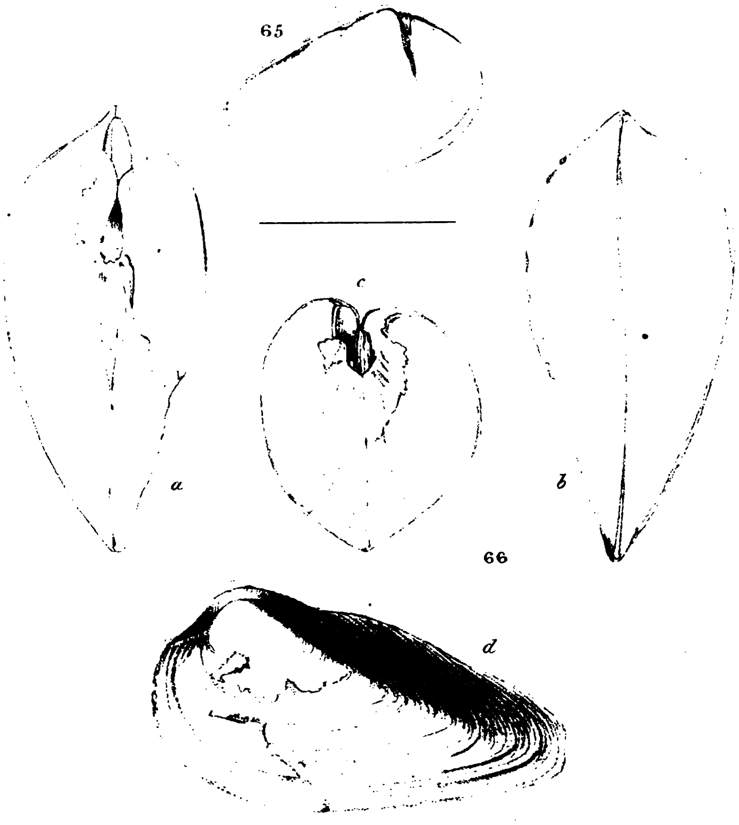

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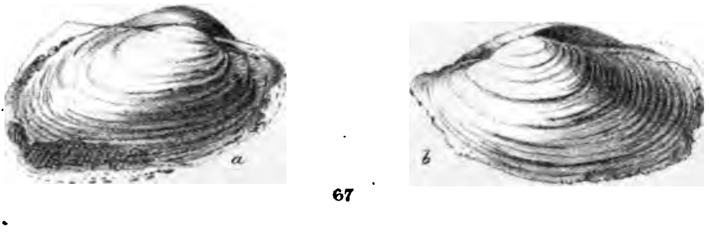

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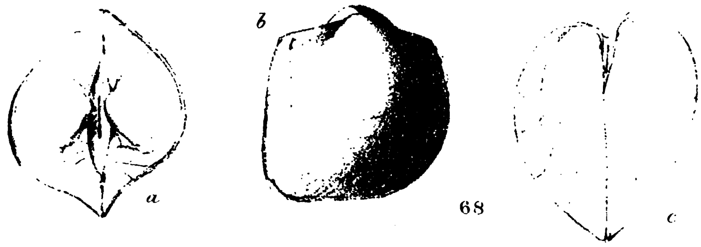

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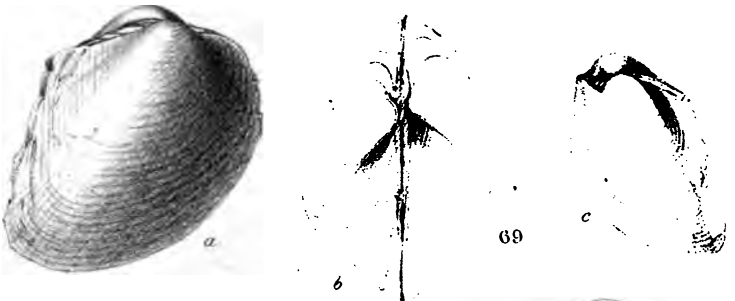

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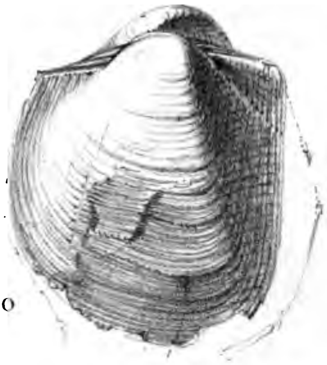

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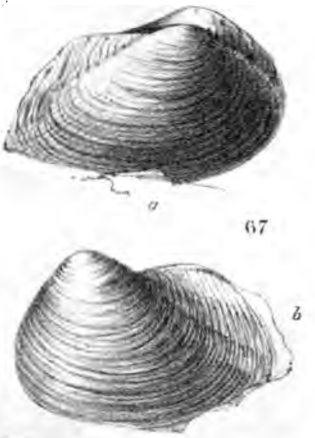

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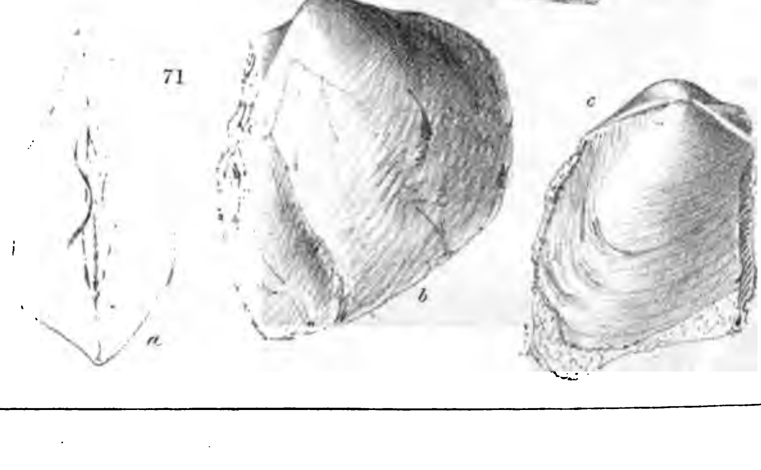

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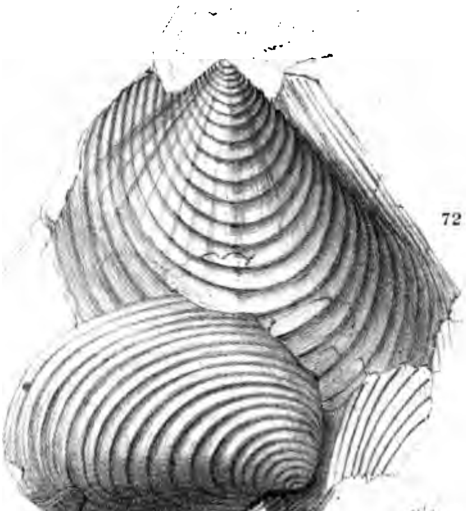
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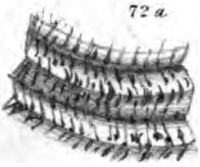
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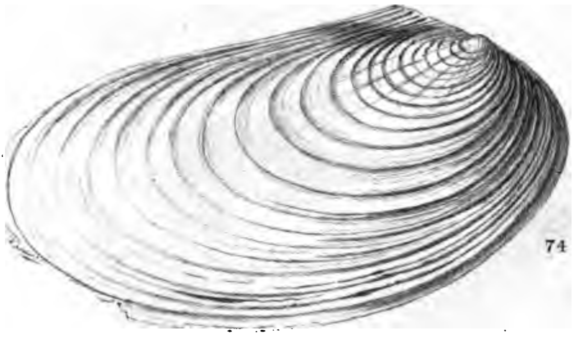
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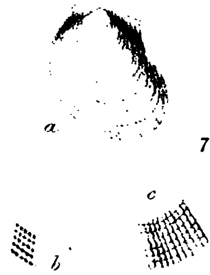
74 b

Pl. XXI



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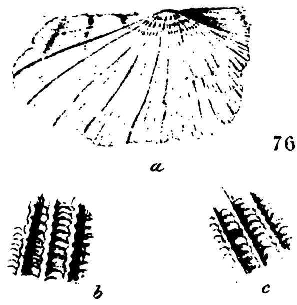

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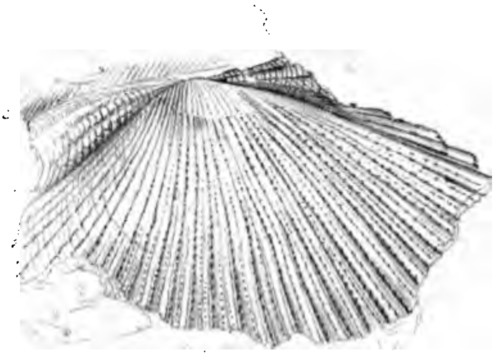

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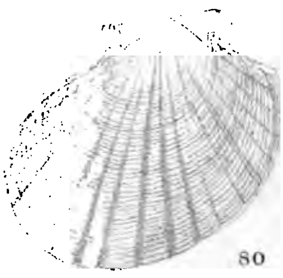

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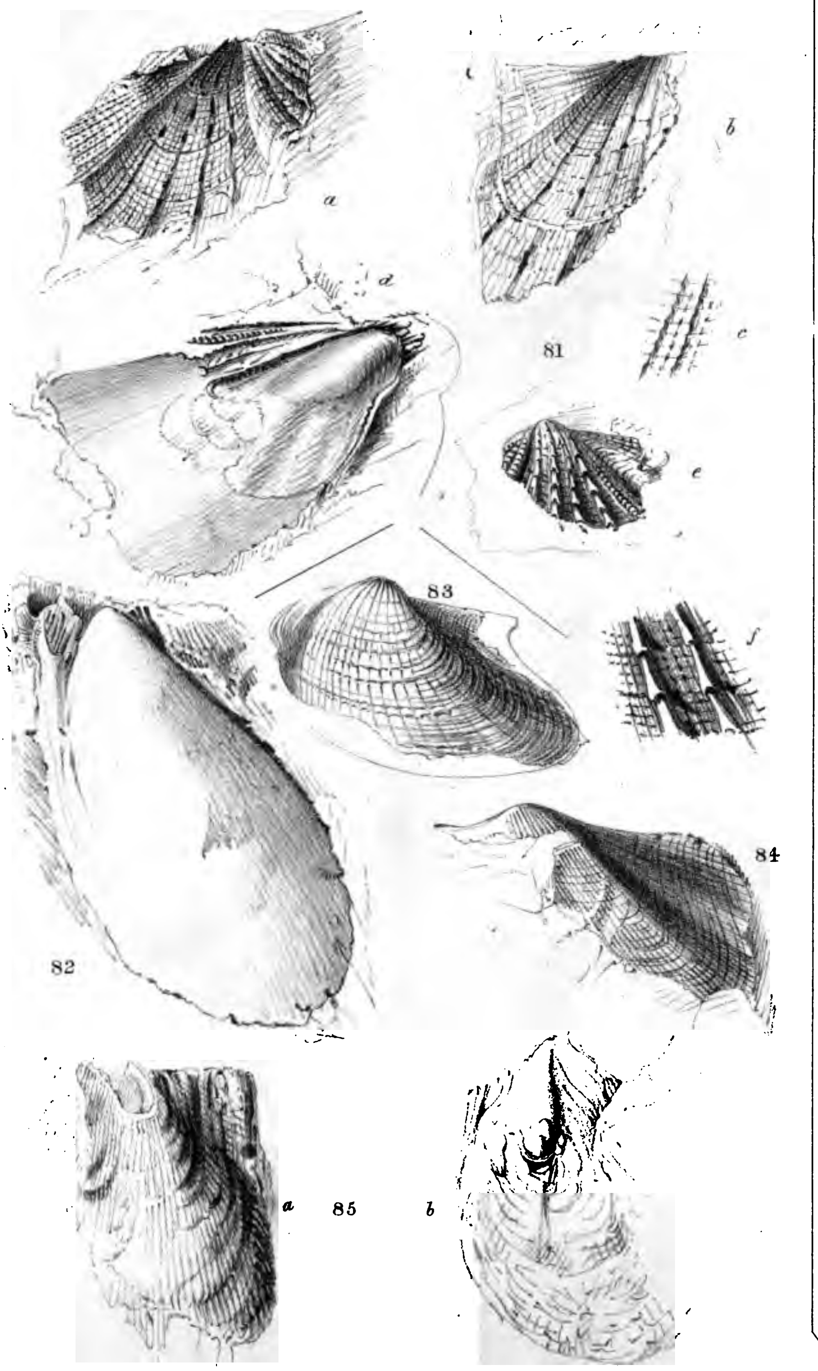
Pl. XXII



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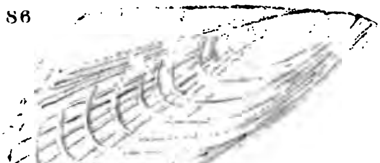

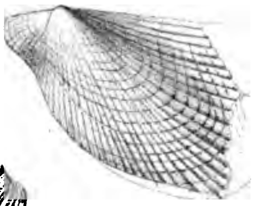

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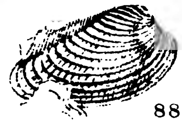

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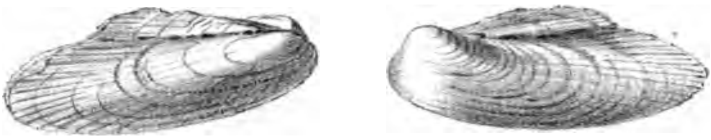

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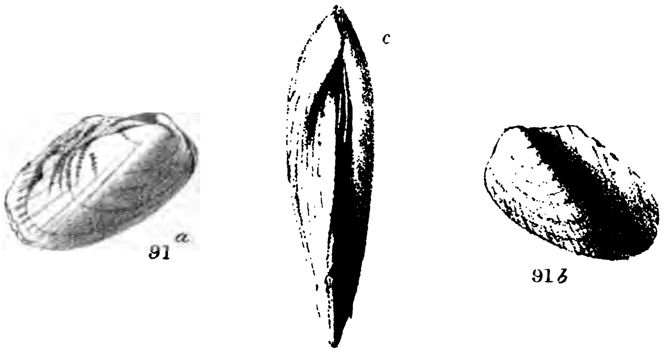

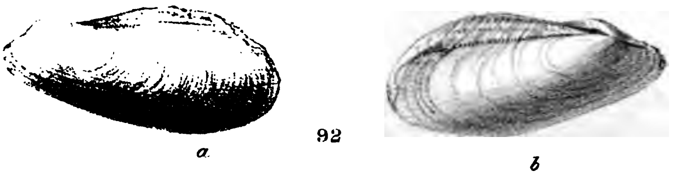

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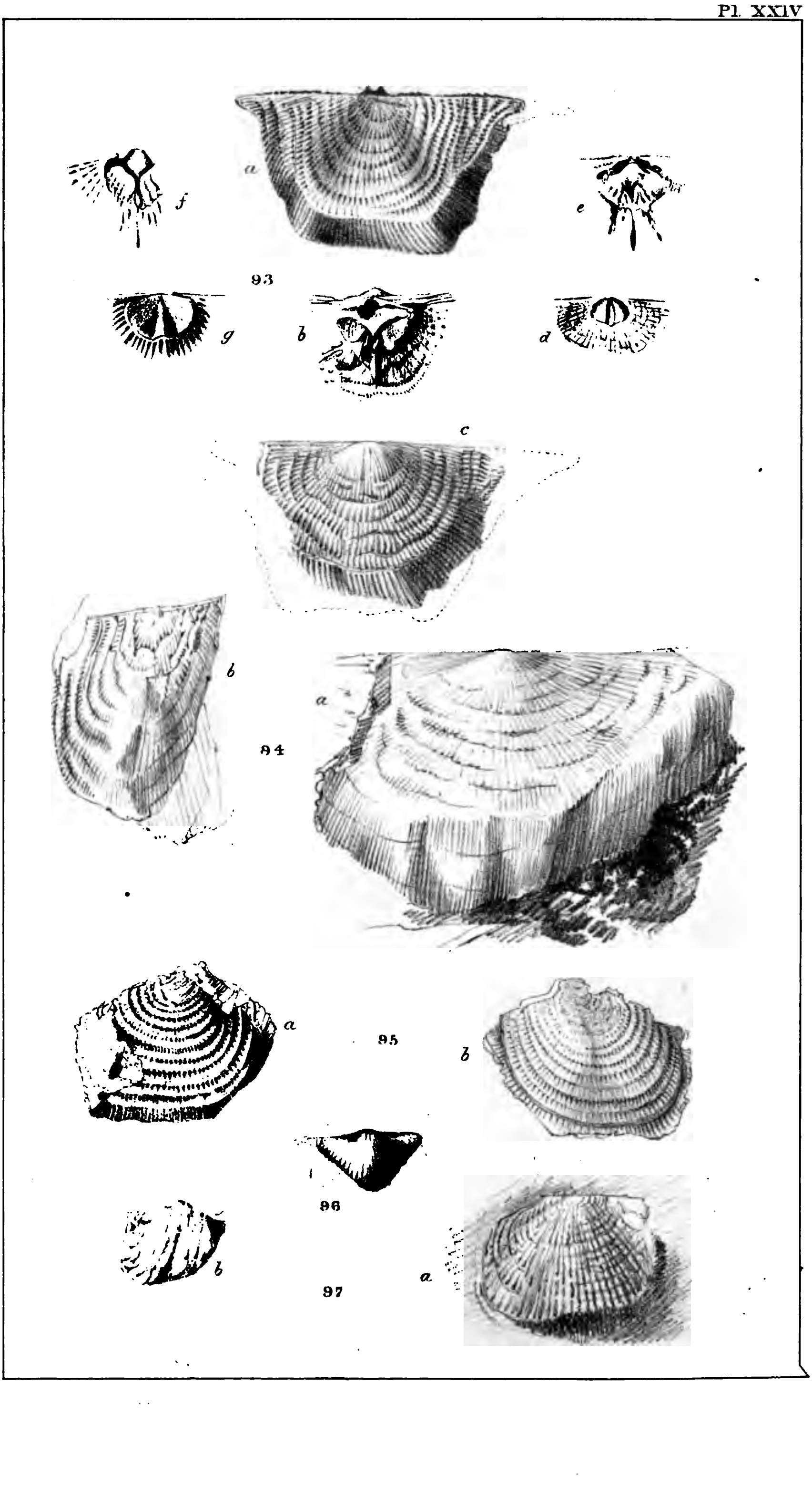
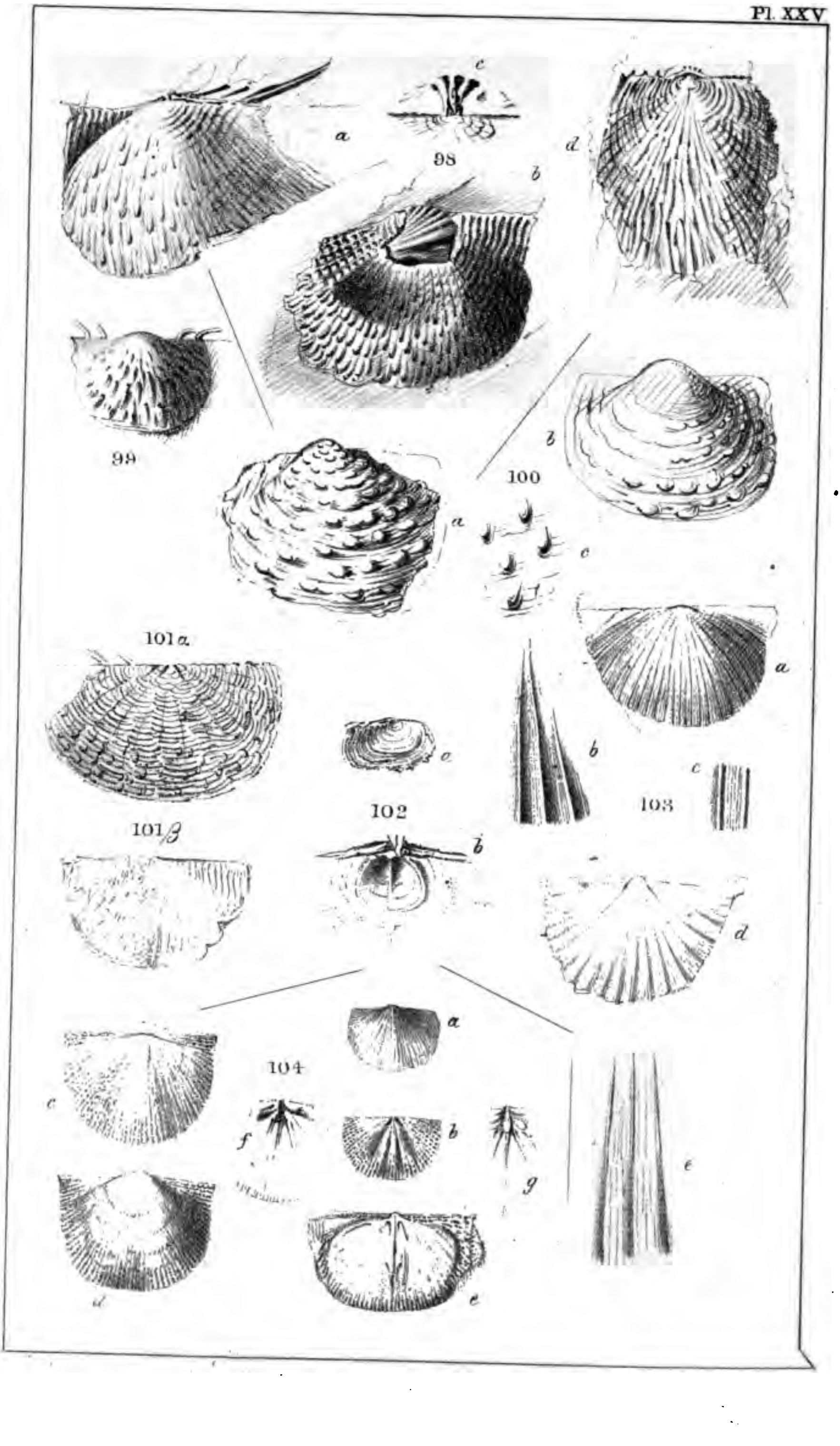


Pl. XXV



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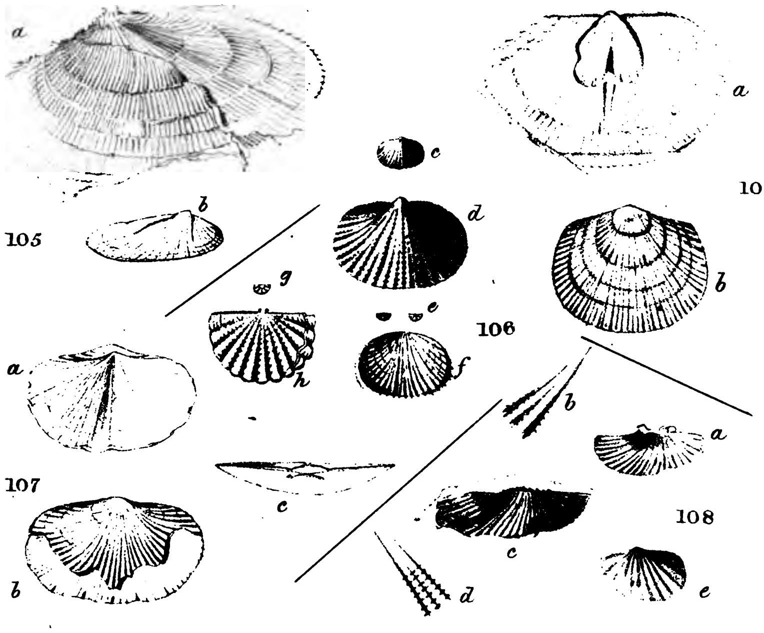
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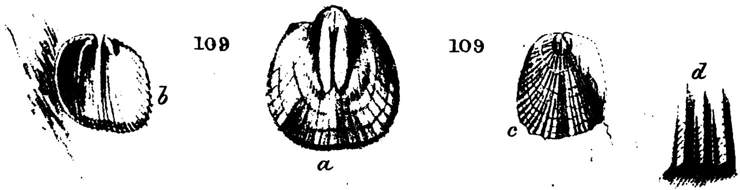
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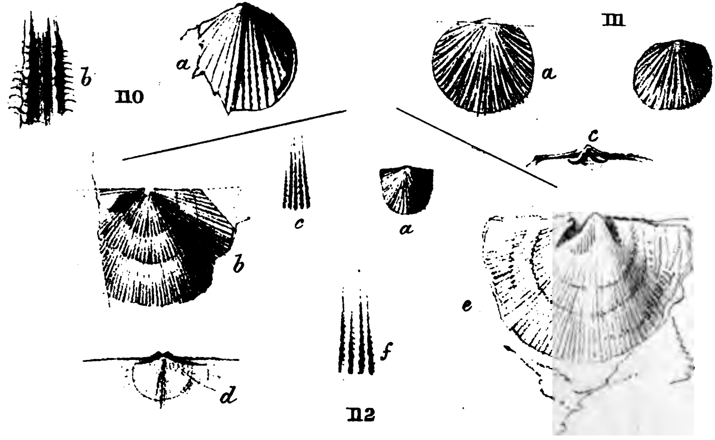
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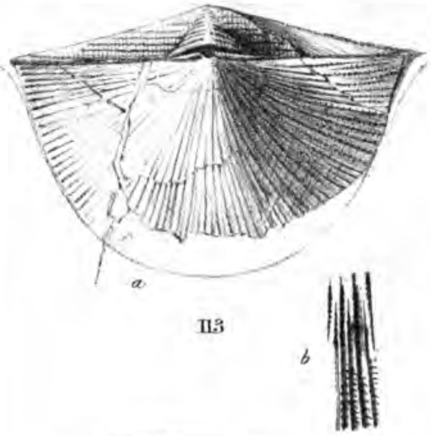

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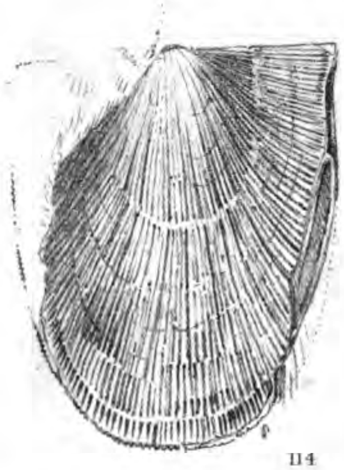

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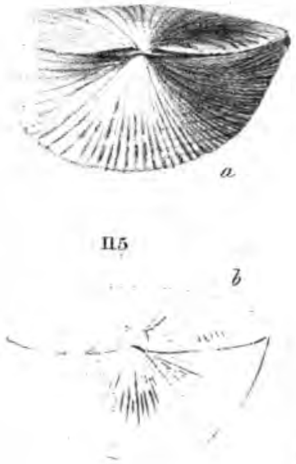

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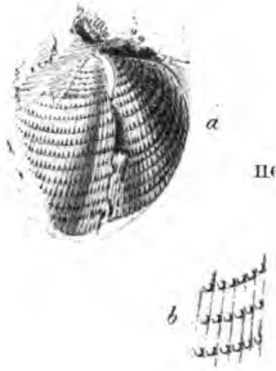

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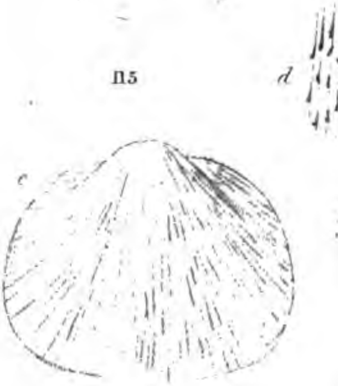

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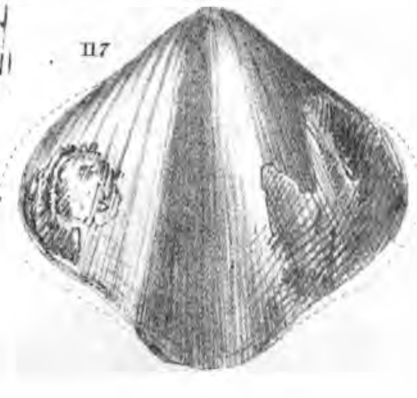

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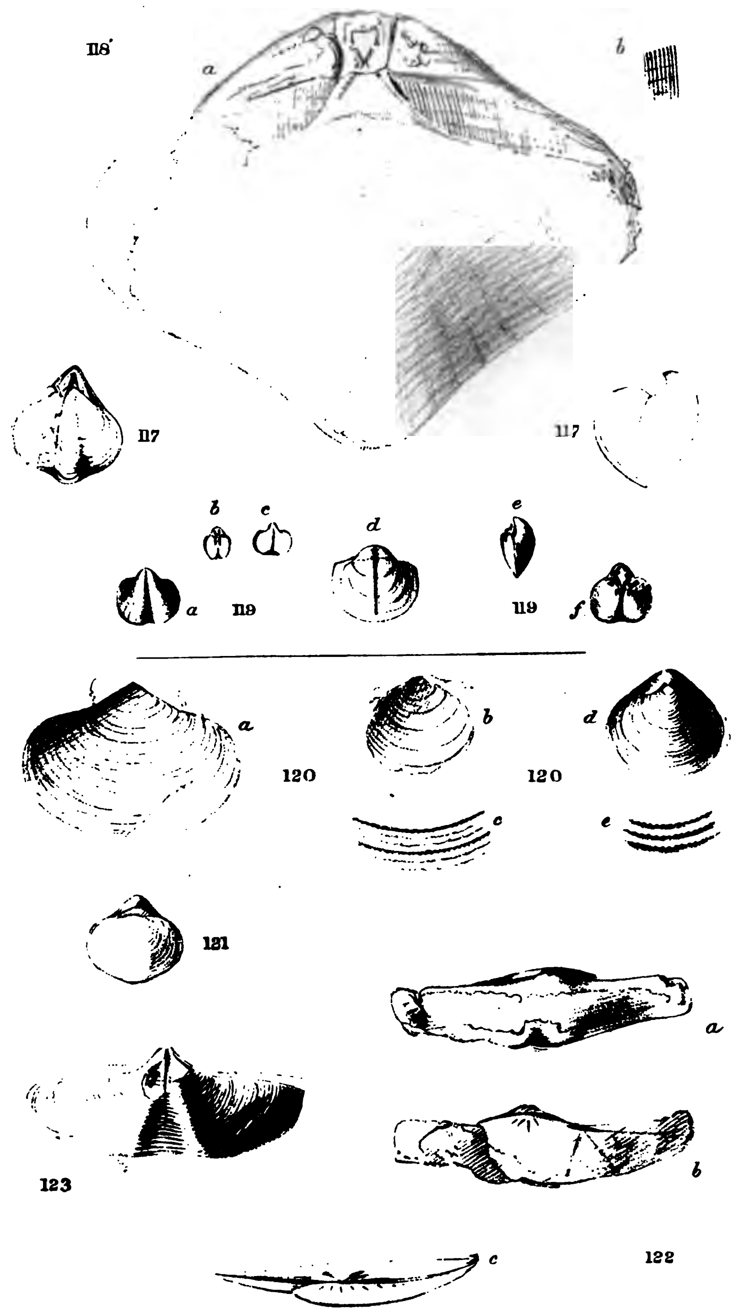
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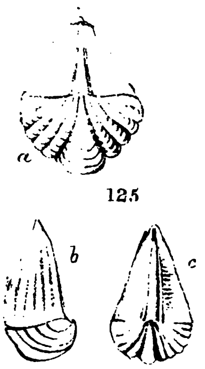
Pl XXIX



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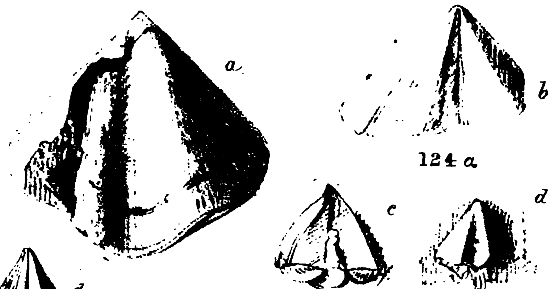

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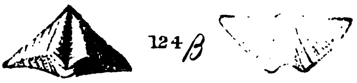
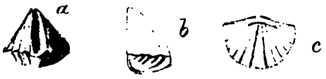


124 β

127



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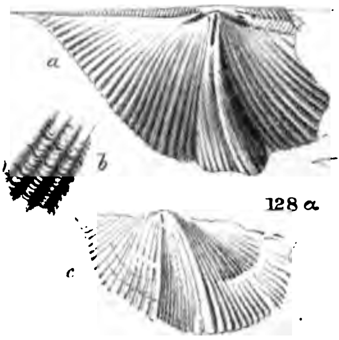
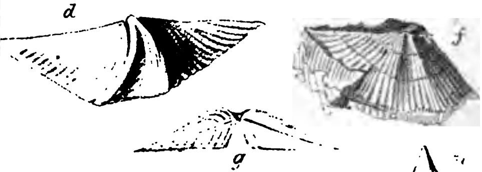


128 *a*

128 β



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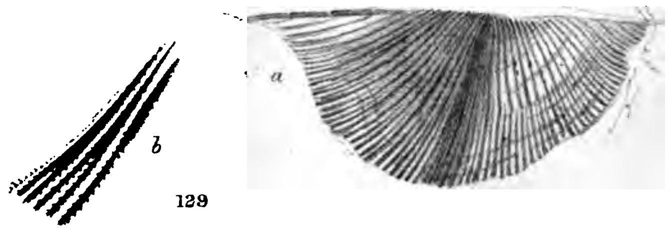

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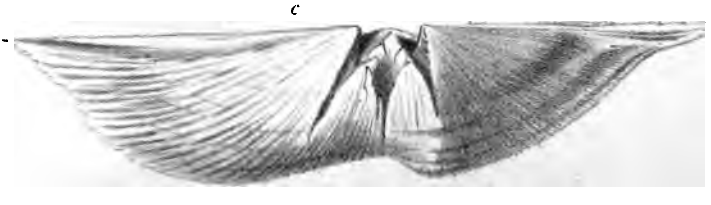

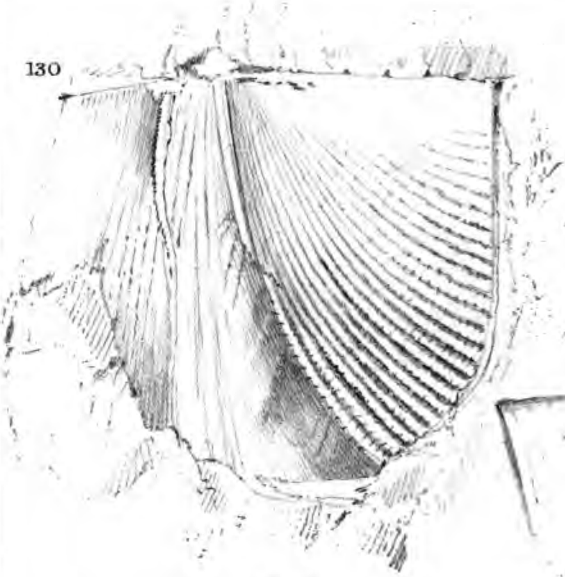
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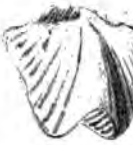
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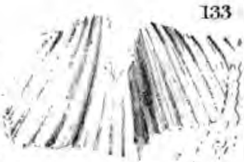
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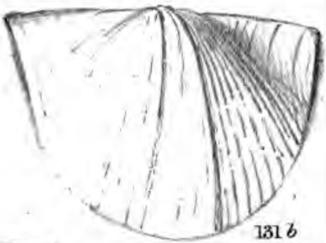
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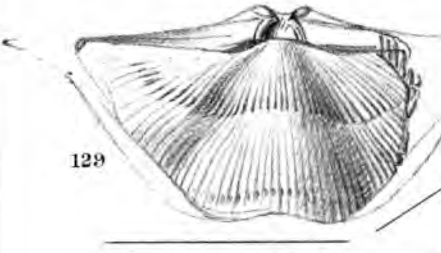
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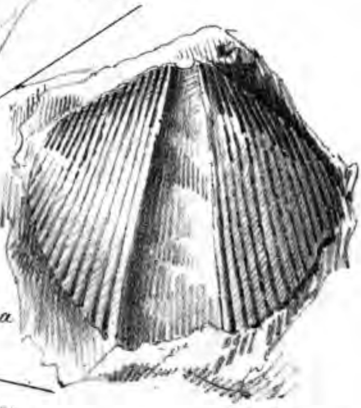
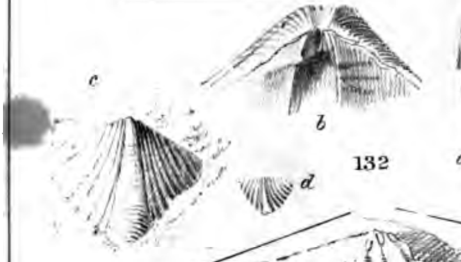
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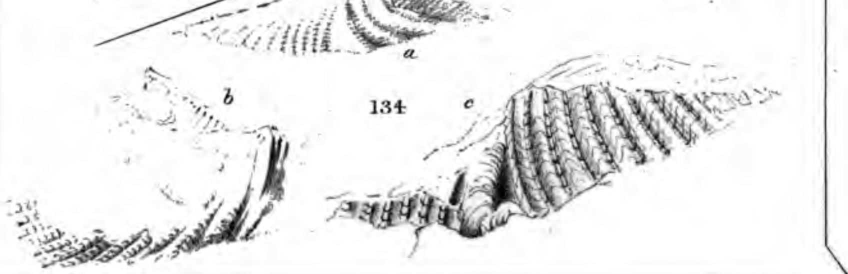
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Pl. XXXI

135

a

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136

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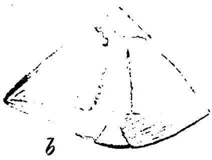
a .... 137 .... b



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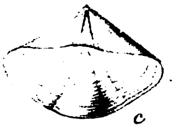
138 a



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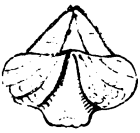

138β

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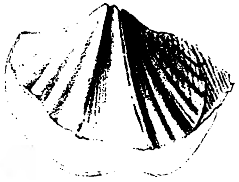
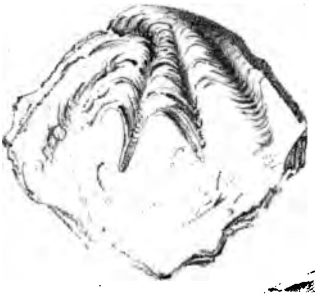


139 a

140 a



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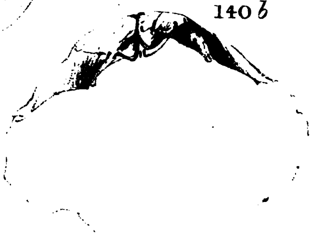
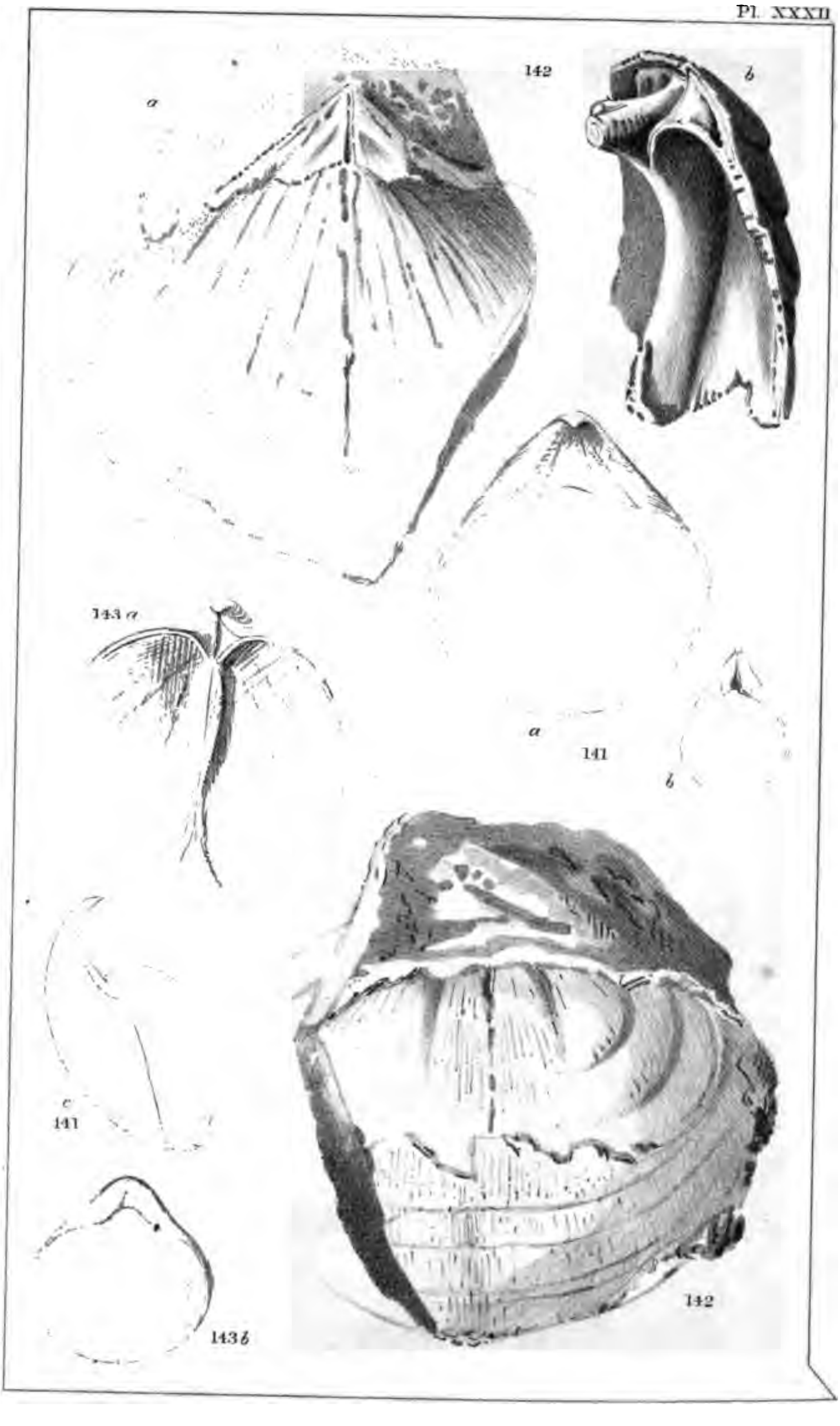
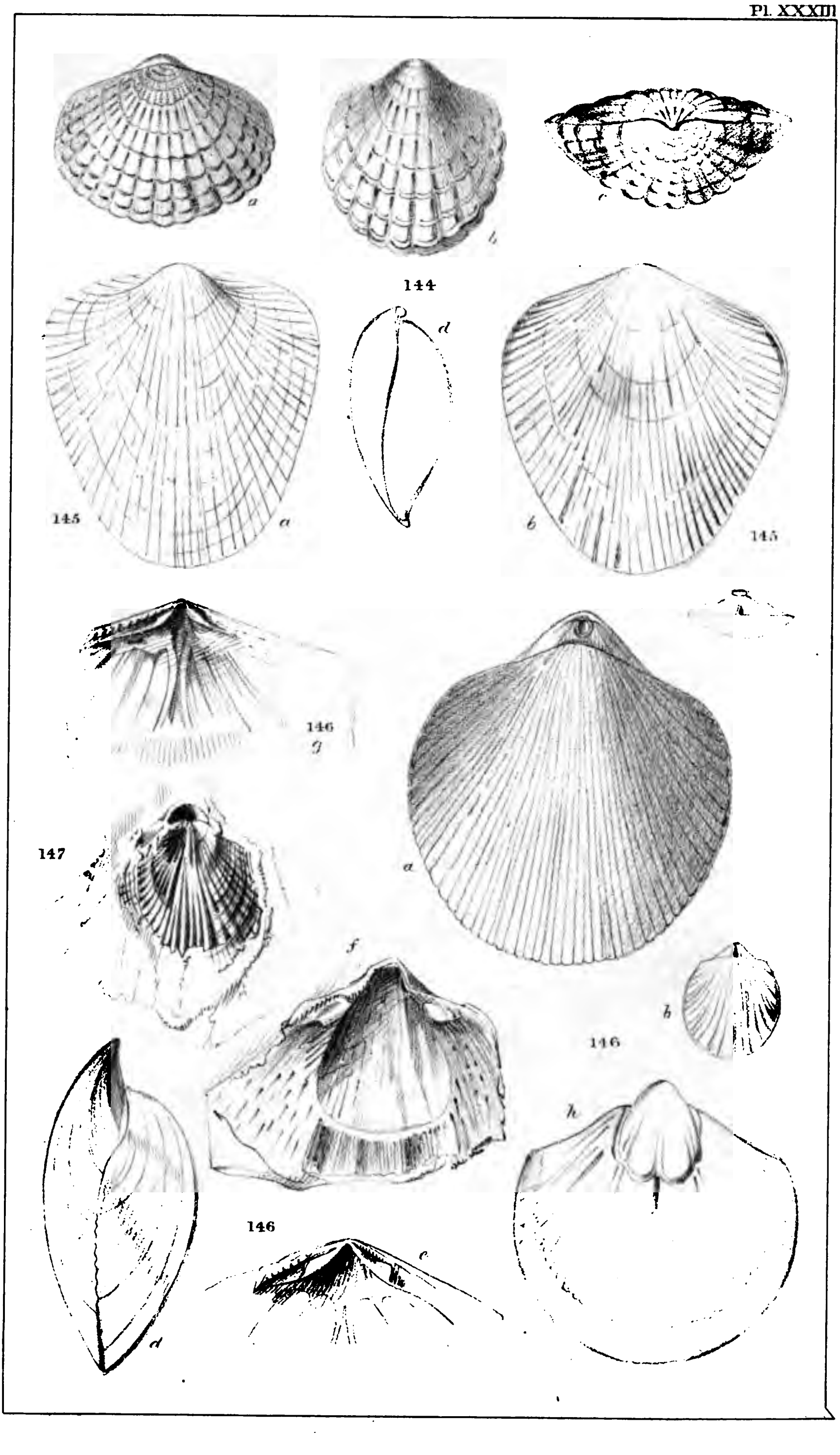


139 b

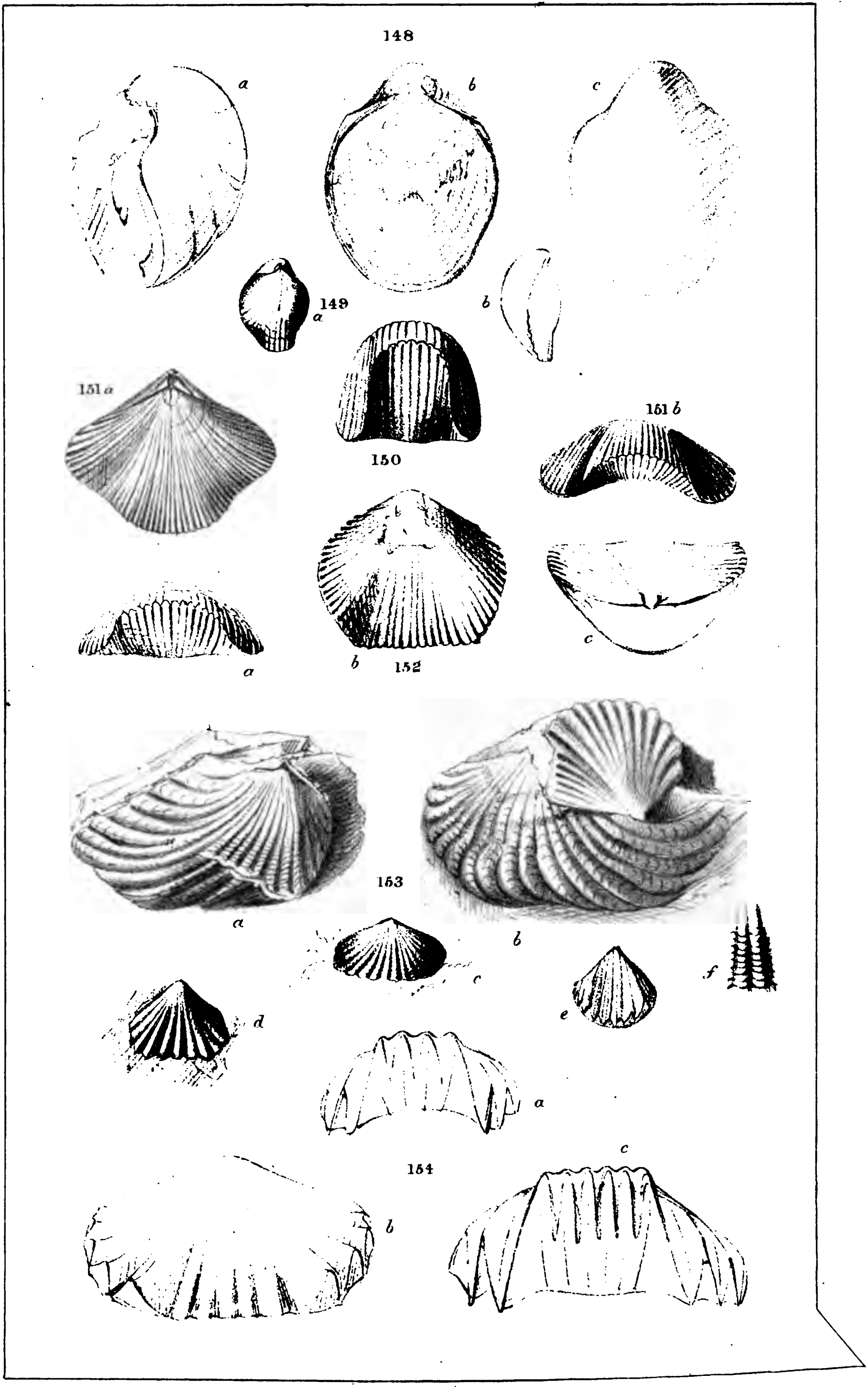
Pl. XXXII



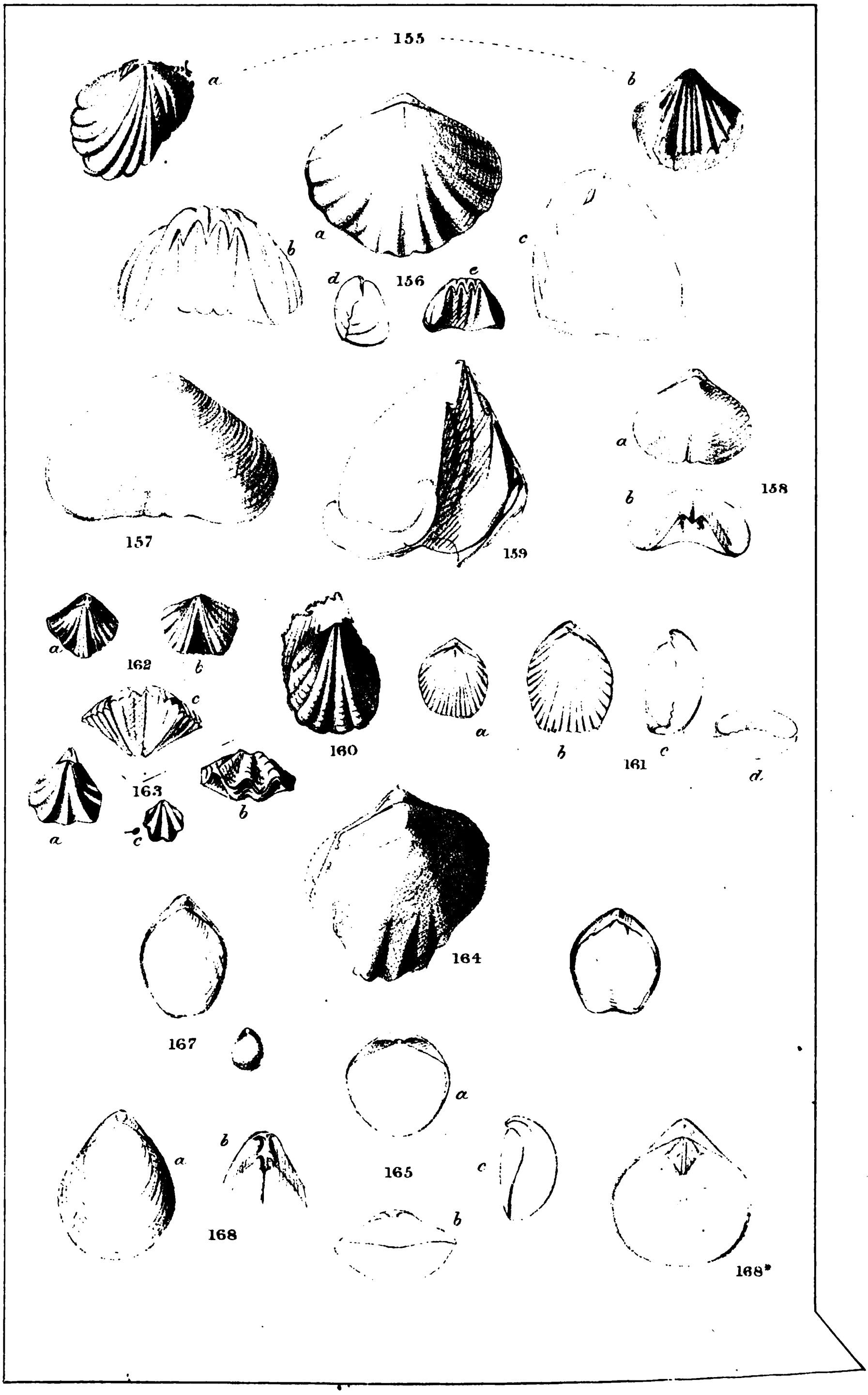
Pl. XXXIII



Pl. XXXIV



Pl. XXXV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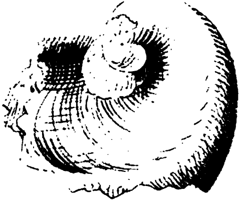
168*

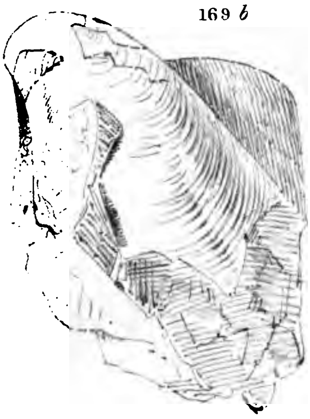
Pl. XXXVI

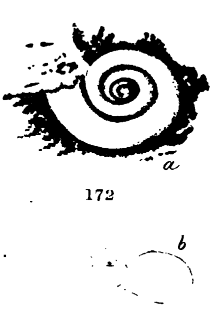
169 a



170

169 b





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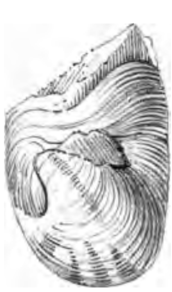
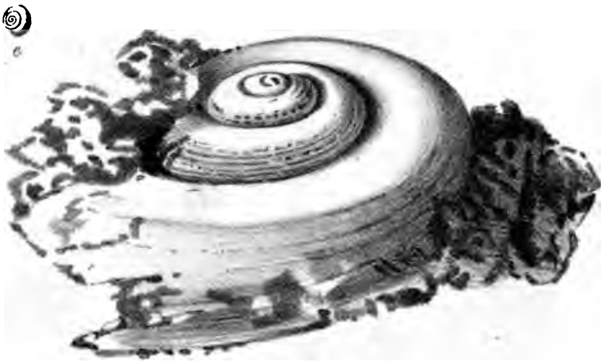


169 c

172



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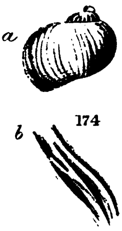
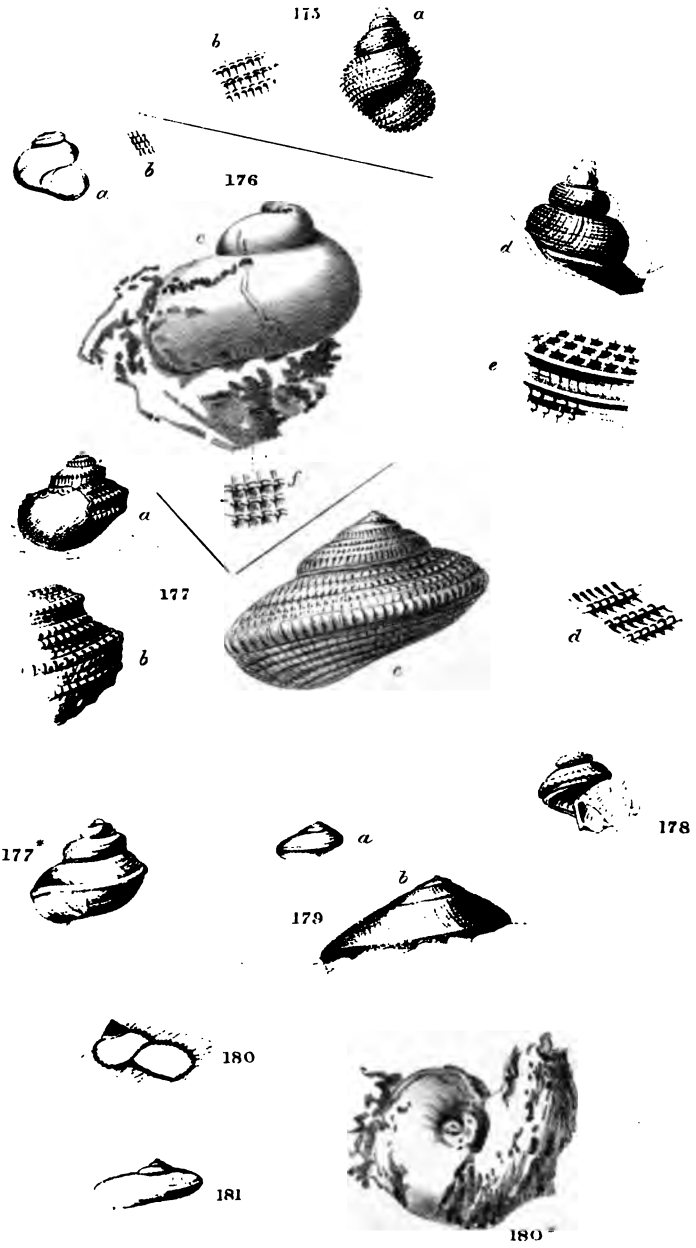
173



174

174*

Pl. XXXVII



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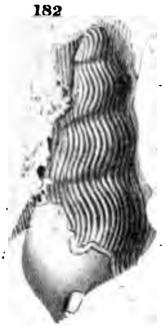

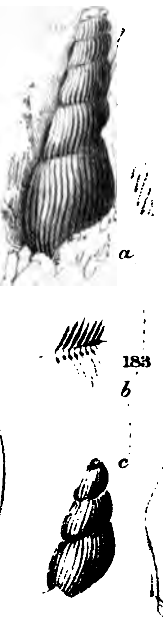

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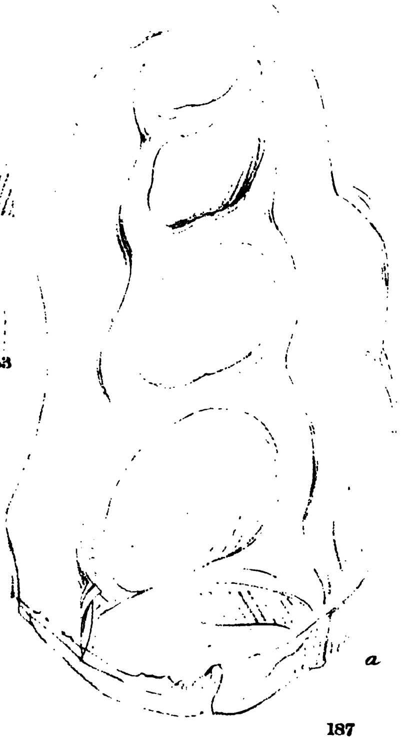
182*



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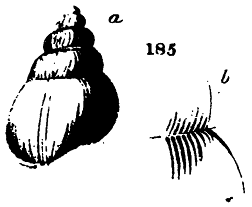

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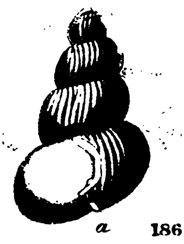

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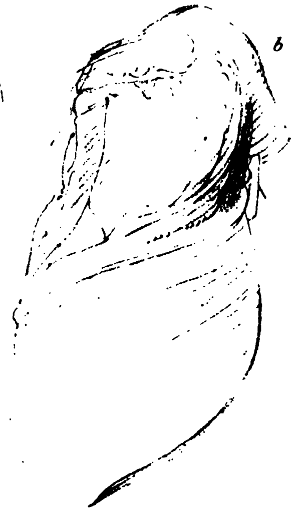
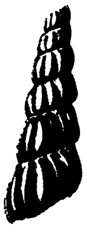
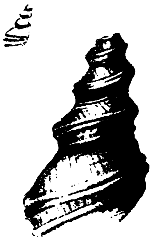




188

187

Pl. XXXIX



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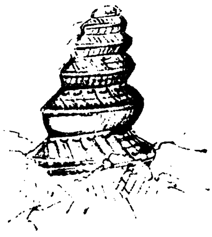

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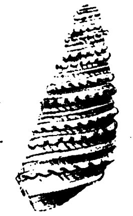

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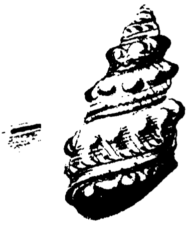
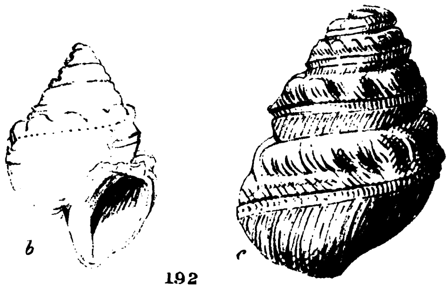


192 *a*



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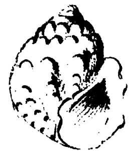

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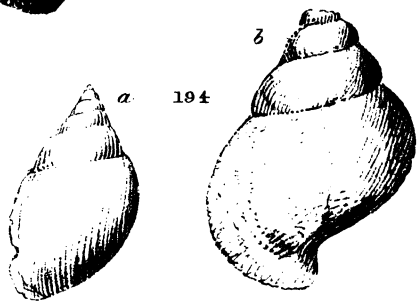

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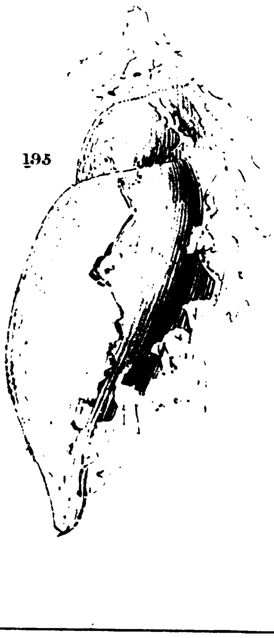

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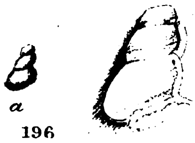

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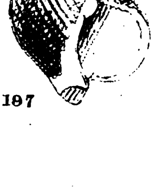

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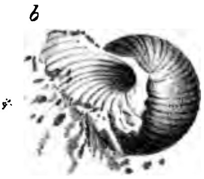
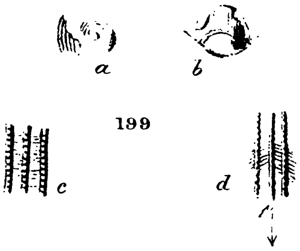
Pl. XL

198





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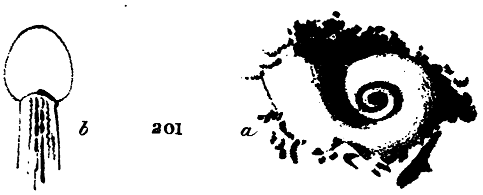

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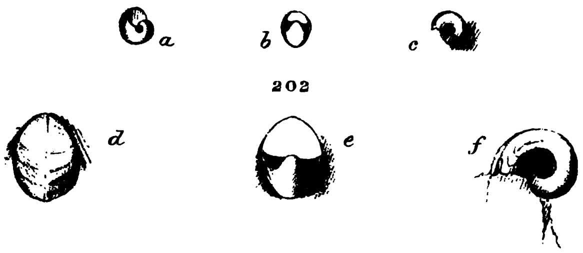

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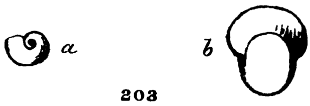

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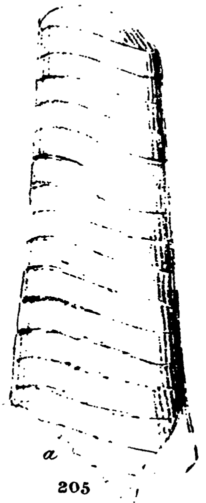

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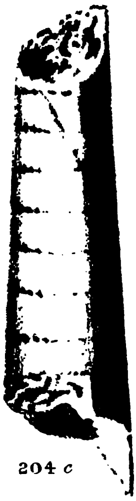

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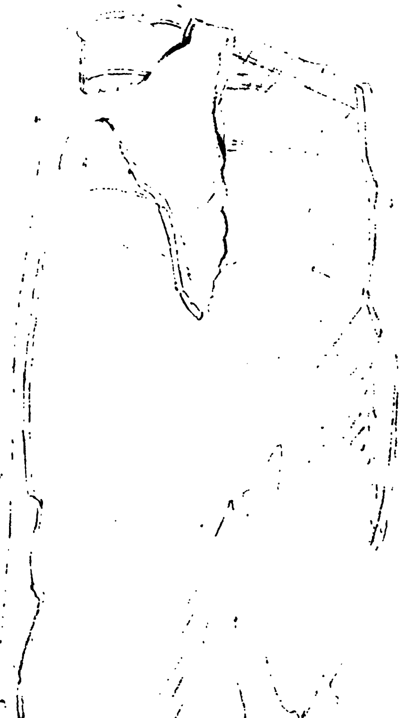
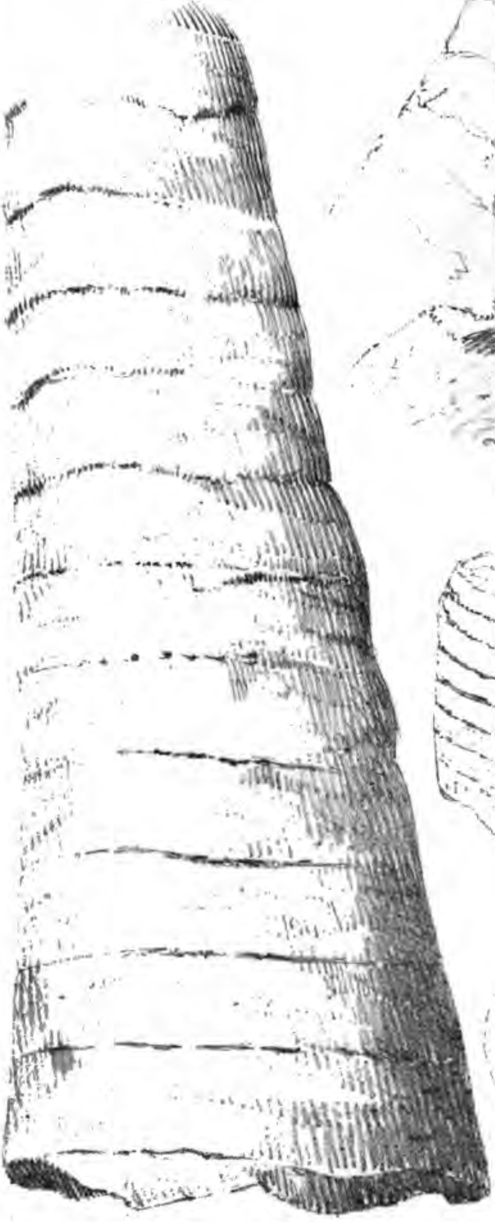
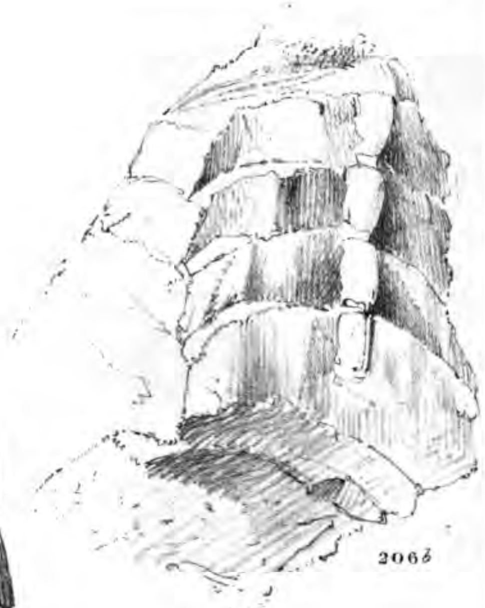


Pl. XLII

206 *a*





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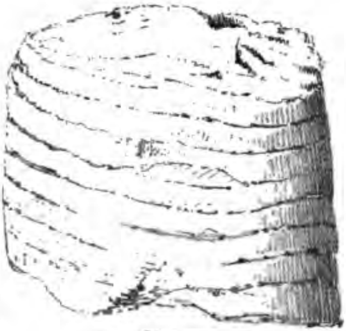

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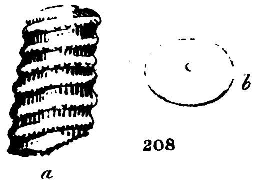
206 *c*

20 Orthoceras tentaculare Phil. p 112

Pl. XLIII



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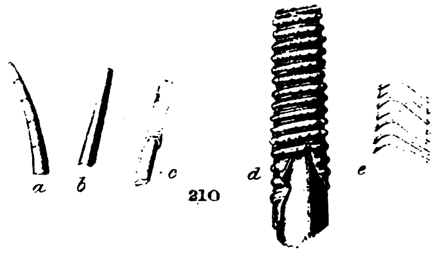

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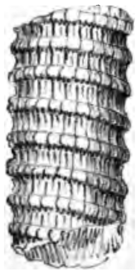

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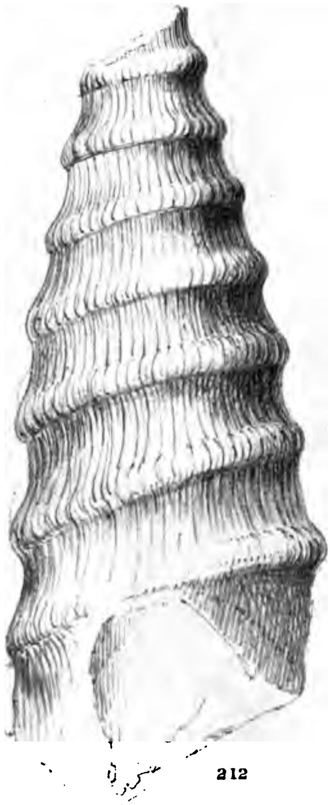

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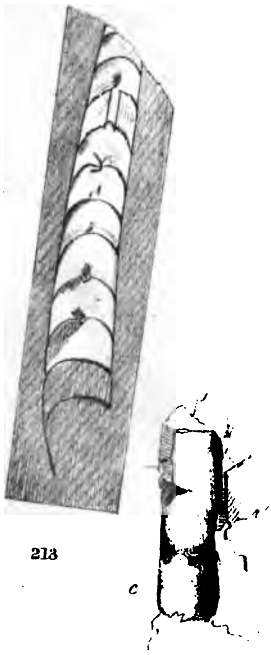

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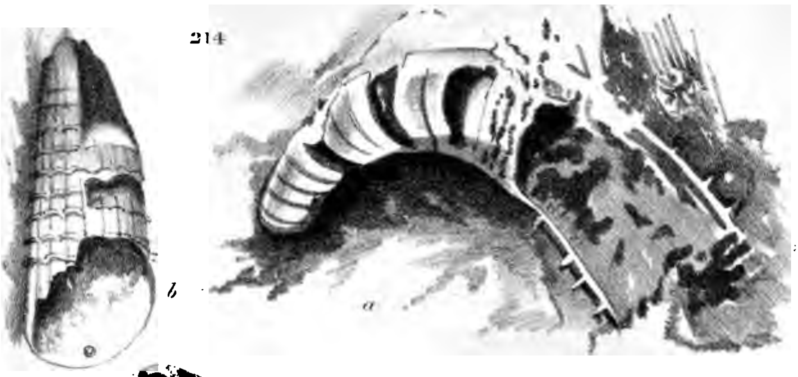

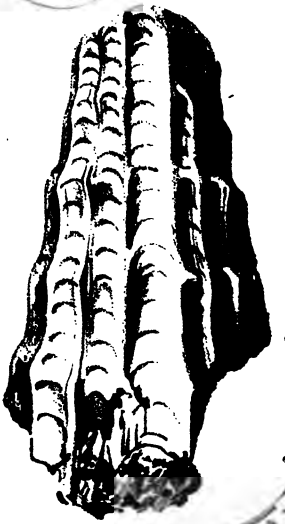

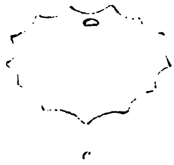

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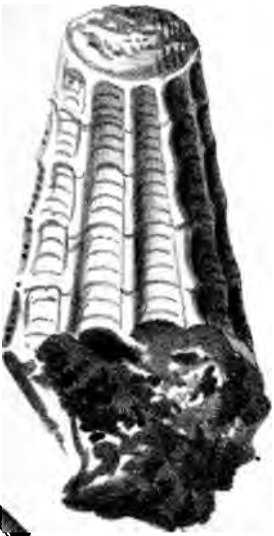
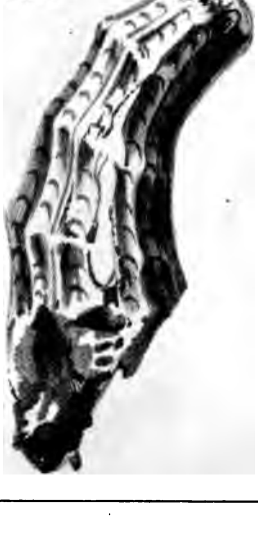
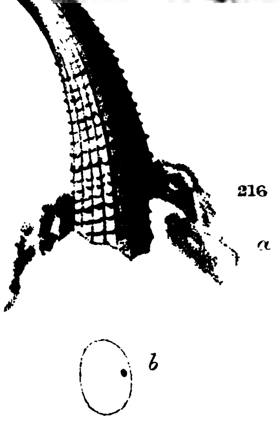
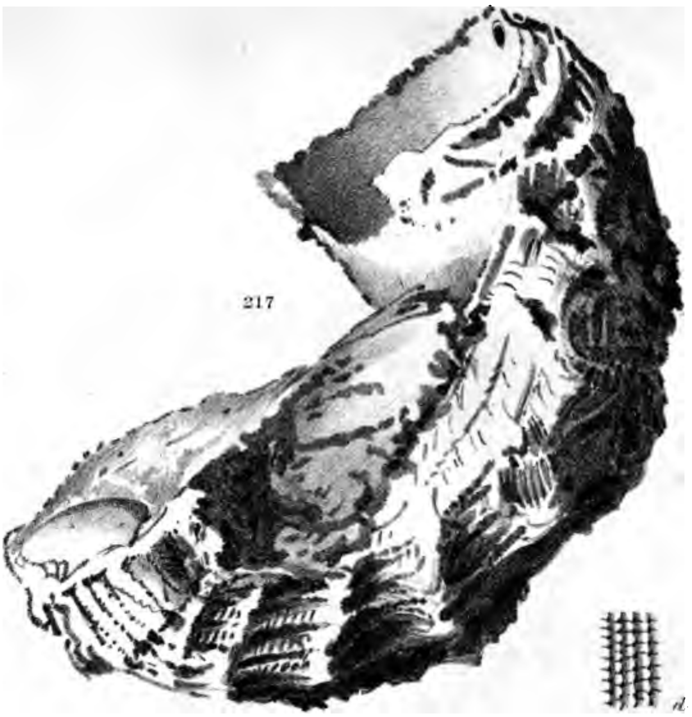






Pl. XLV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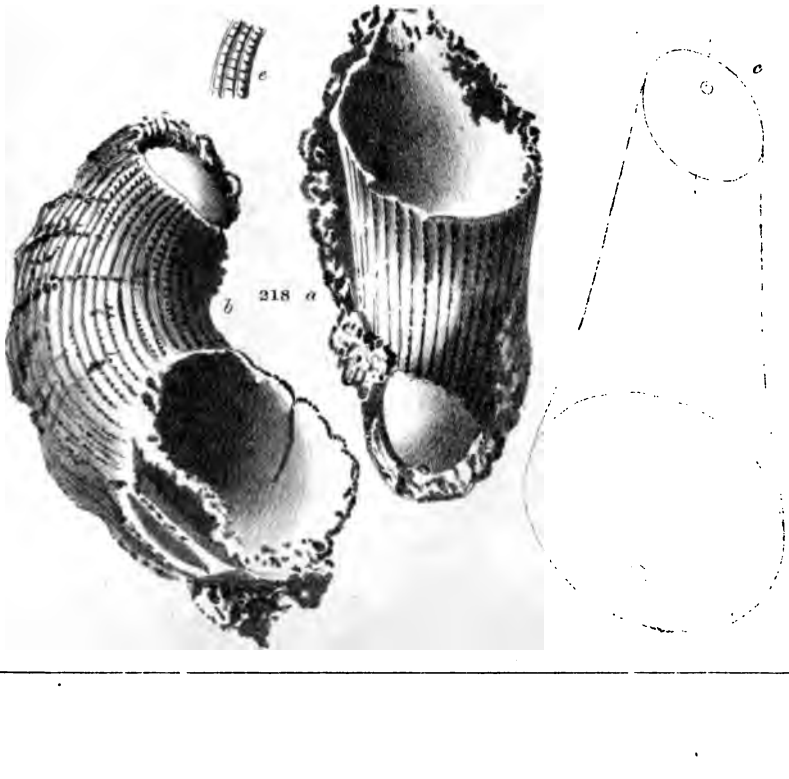
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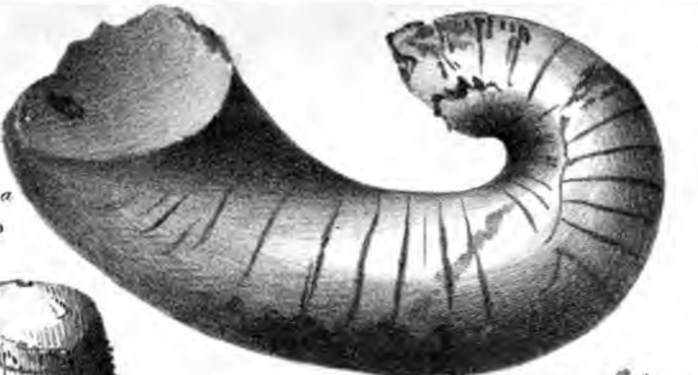

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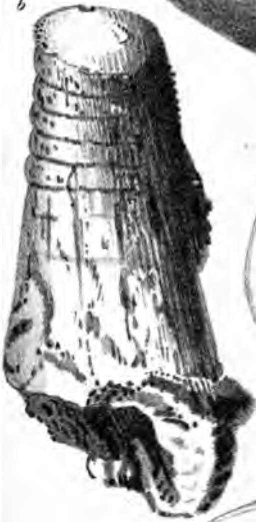

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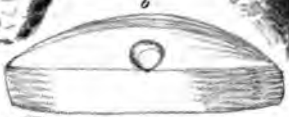

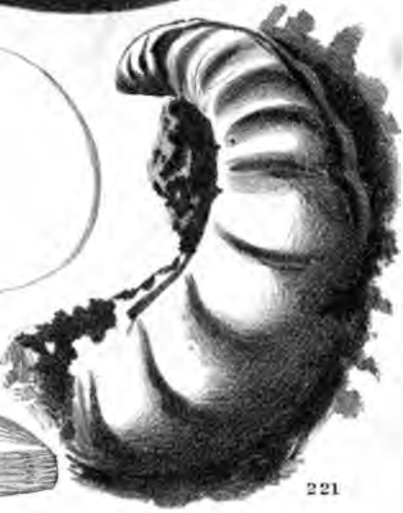

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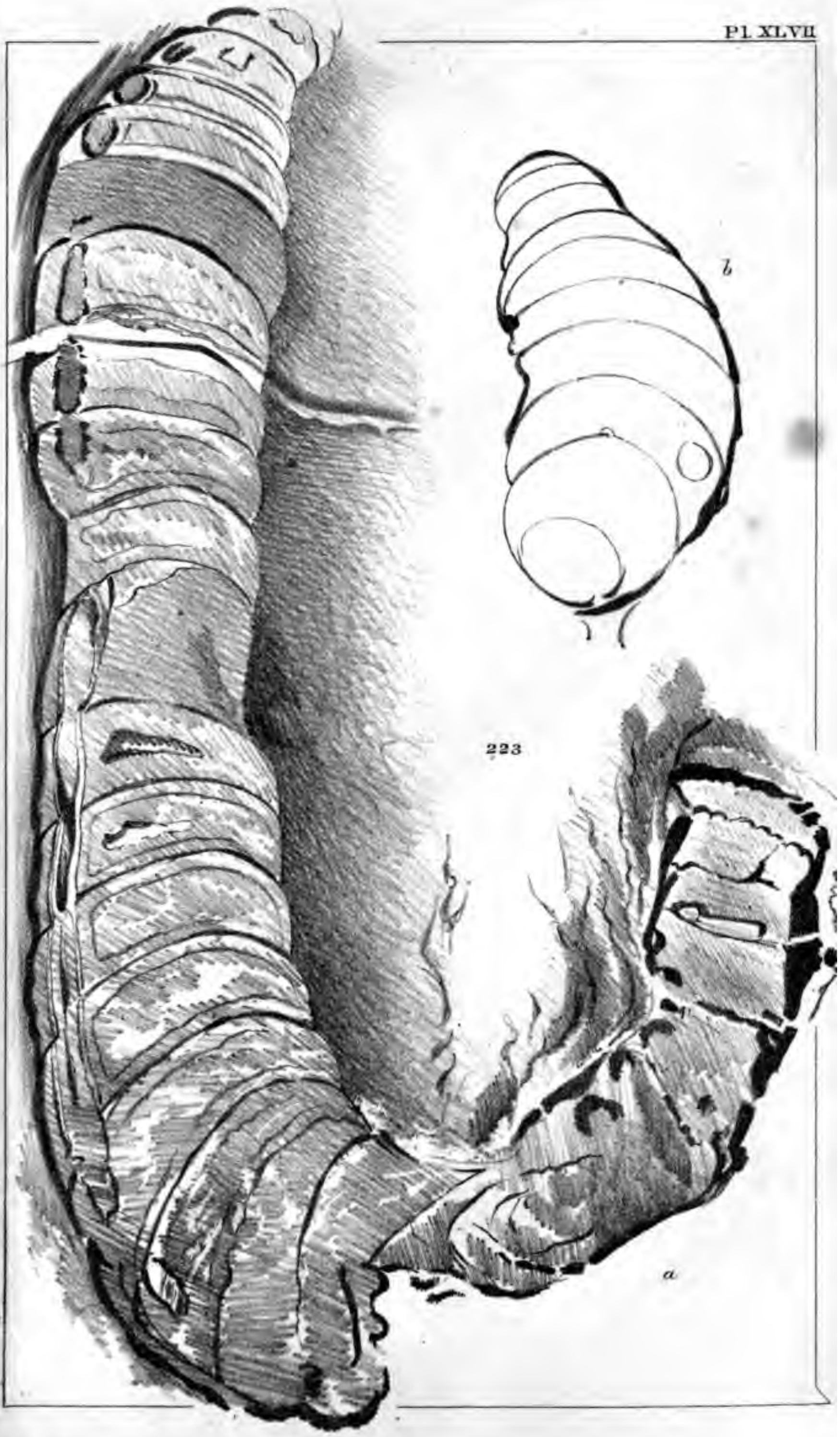
Pl. XLVII



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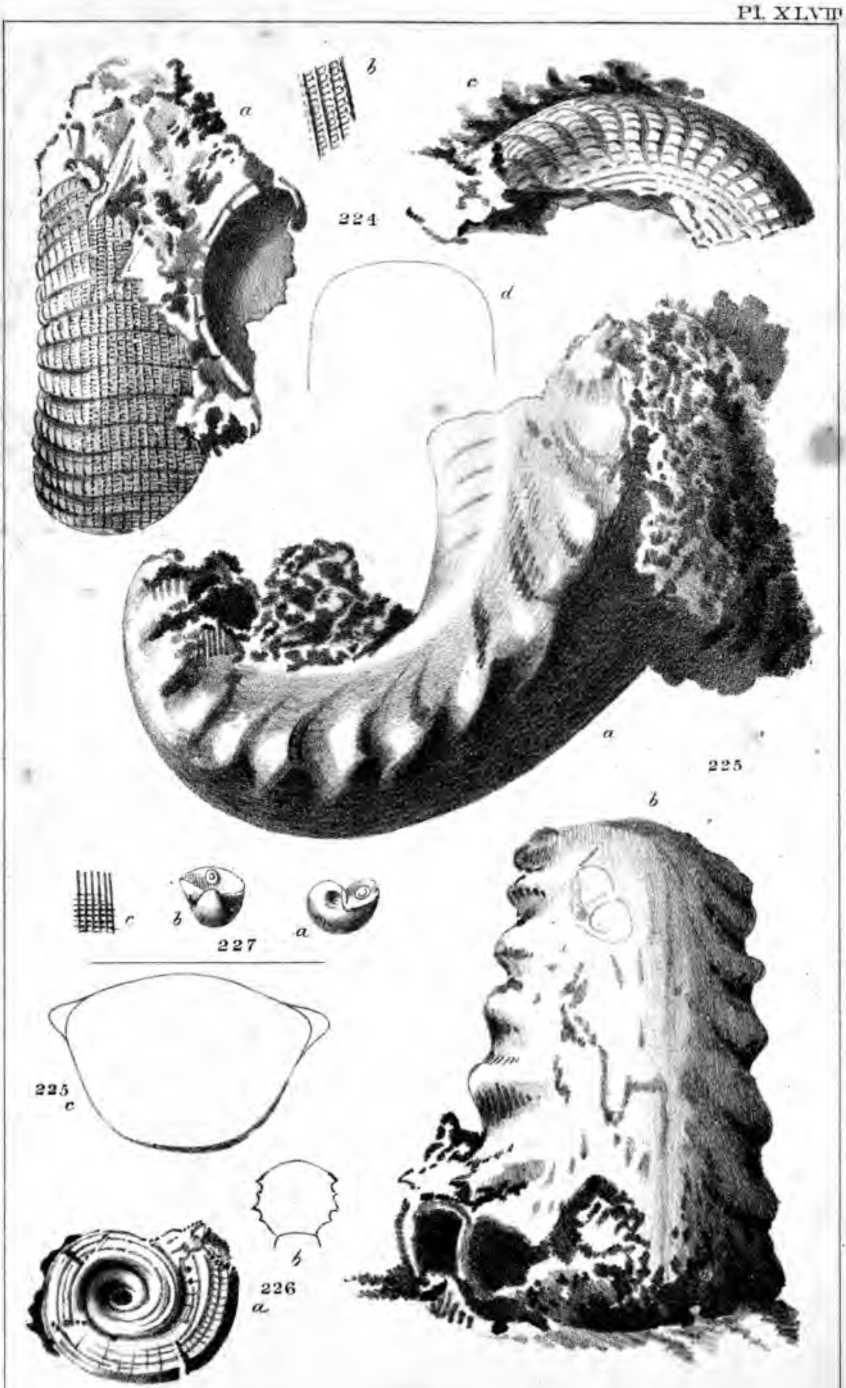
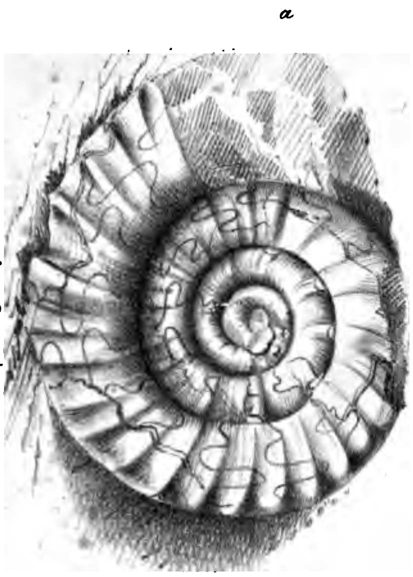
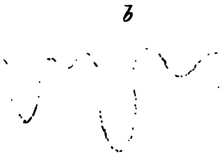
Pl. XLVII







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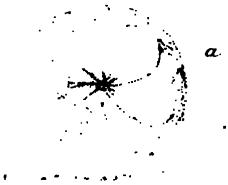

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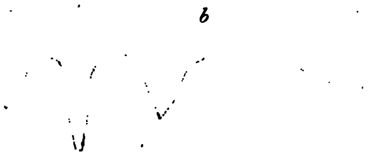

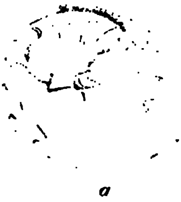

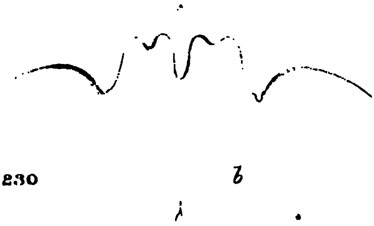

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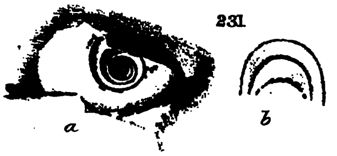
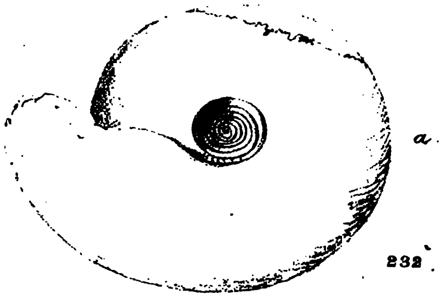
231 – ~~234~~ Gon. globosus
232 G. excavatus p 121
233 G. spiralis p 121
234 G. crenistria p 121

231





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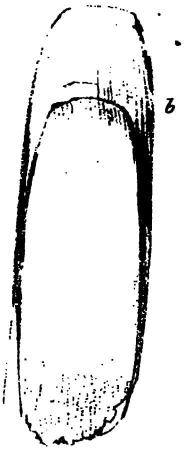

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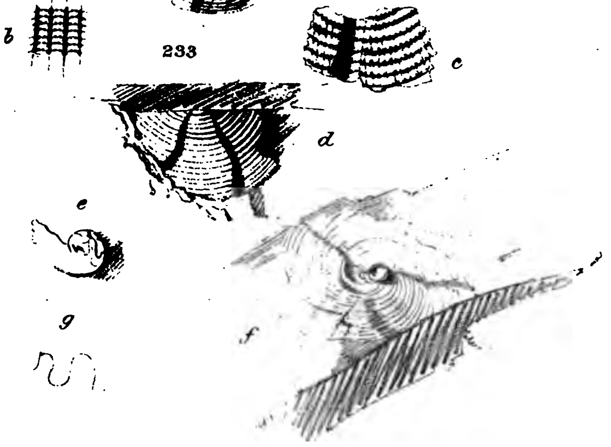

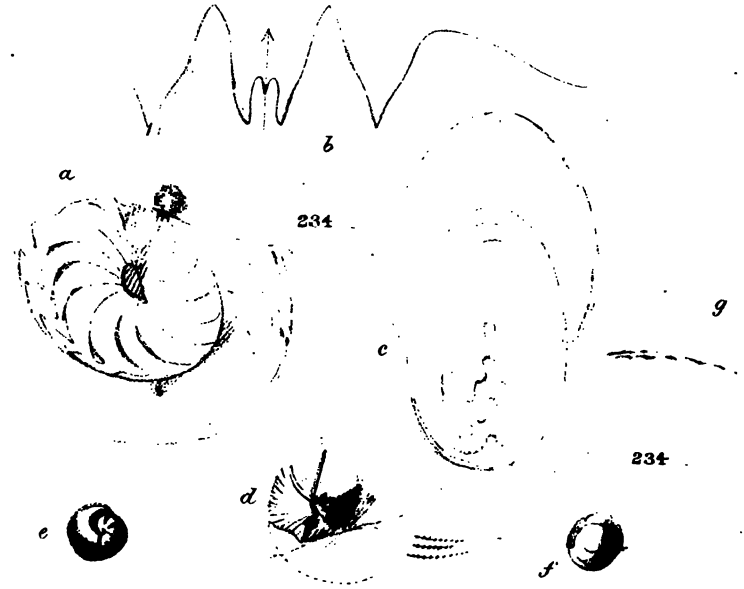

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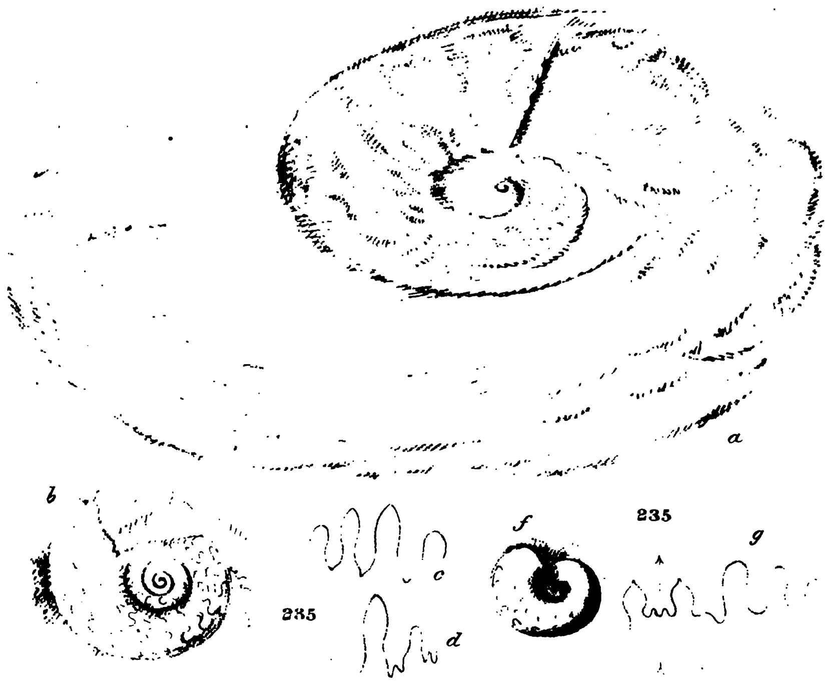

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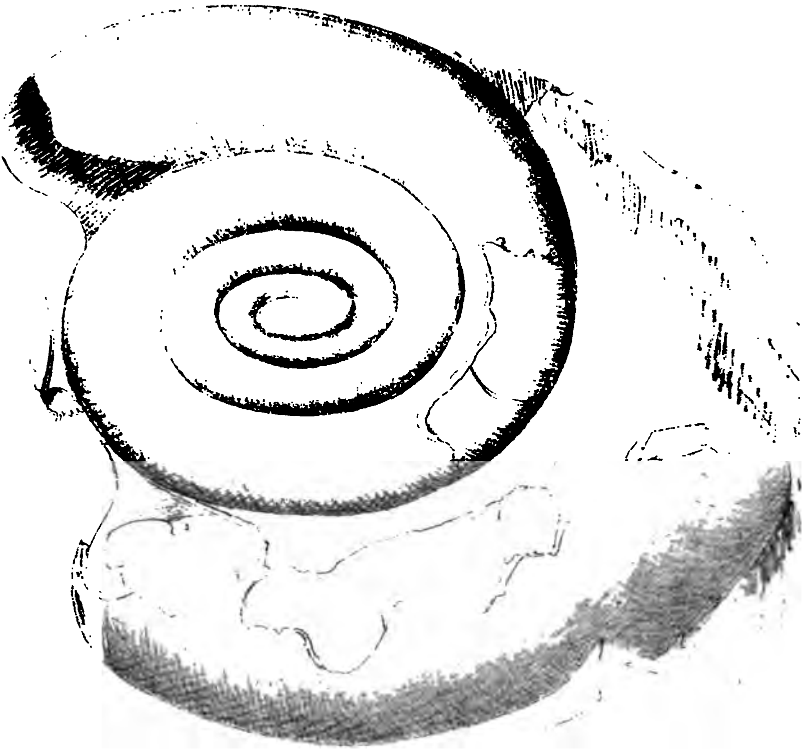
Pl. LII



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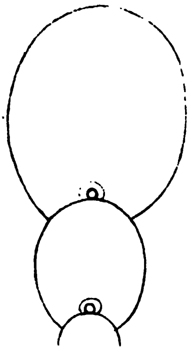

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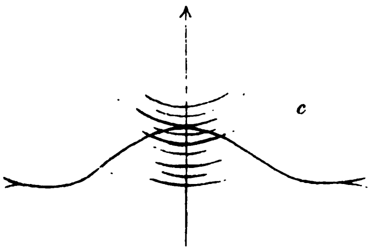

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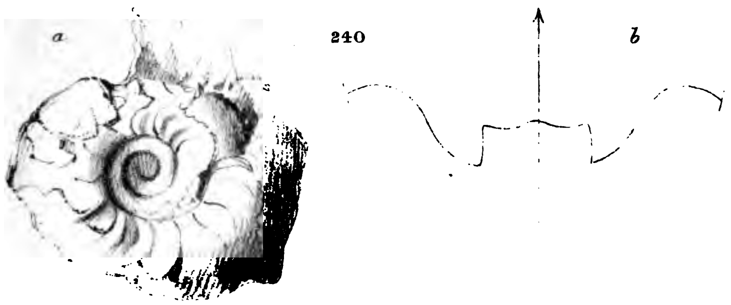

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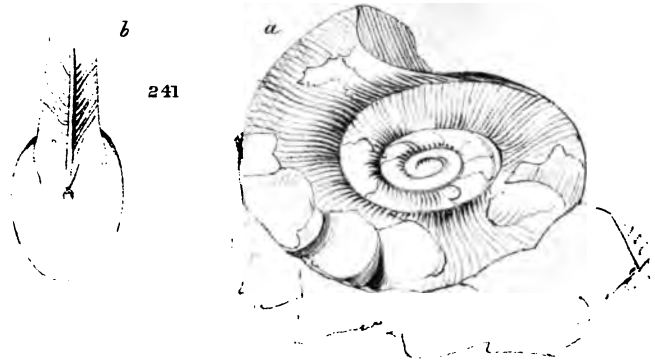

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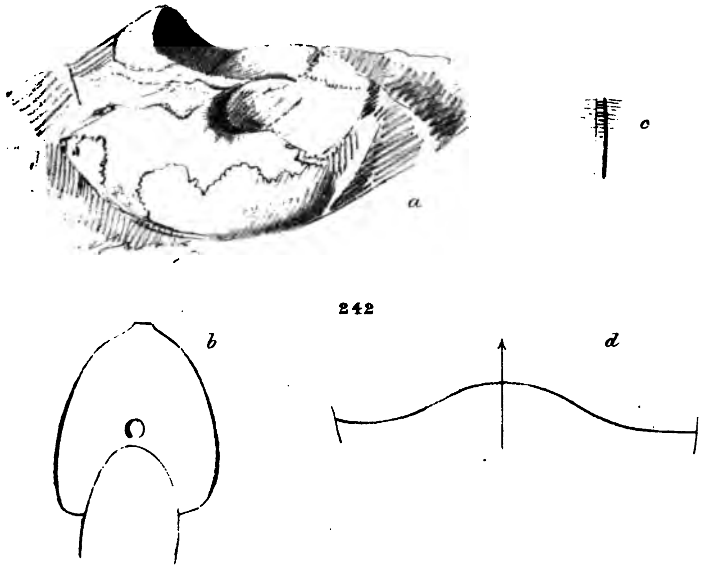

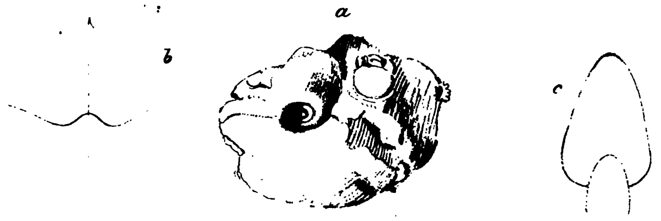

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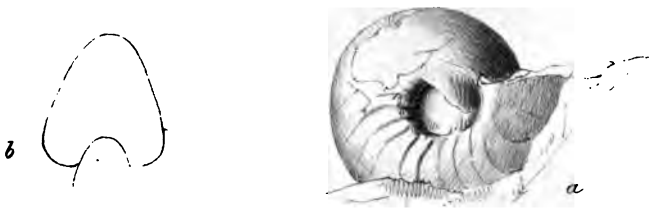

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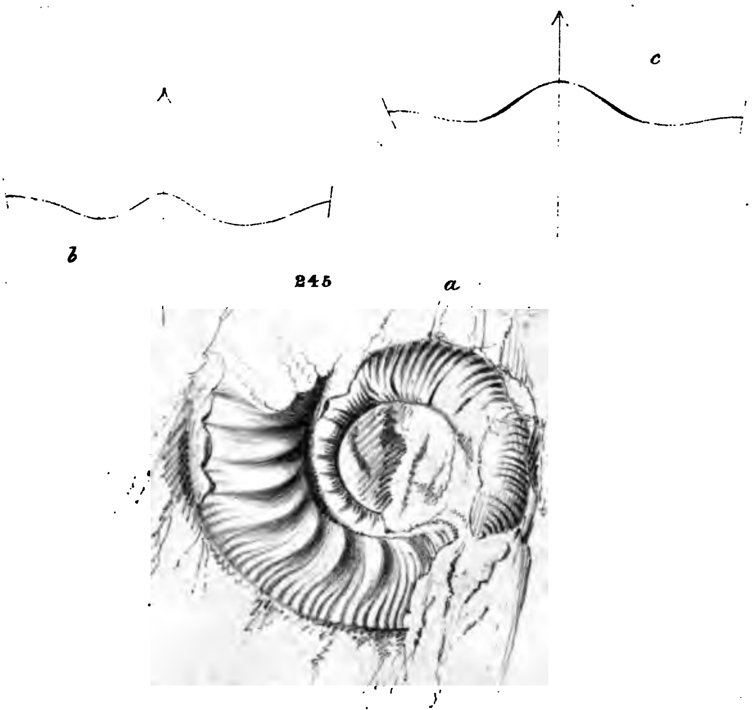

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Pl. LV

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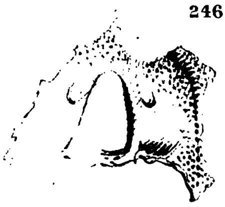

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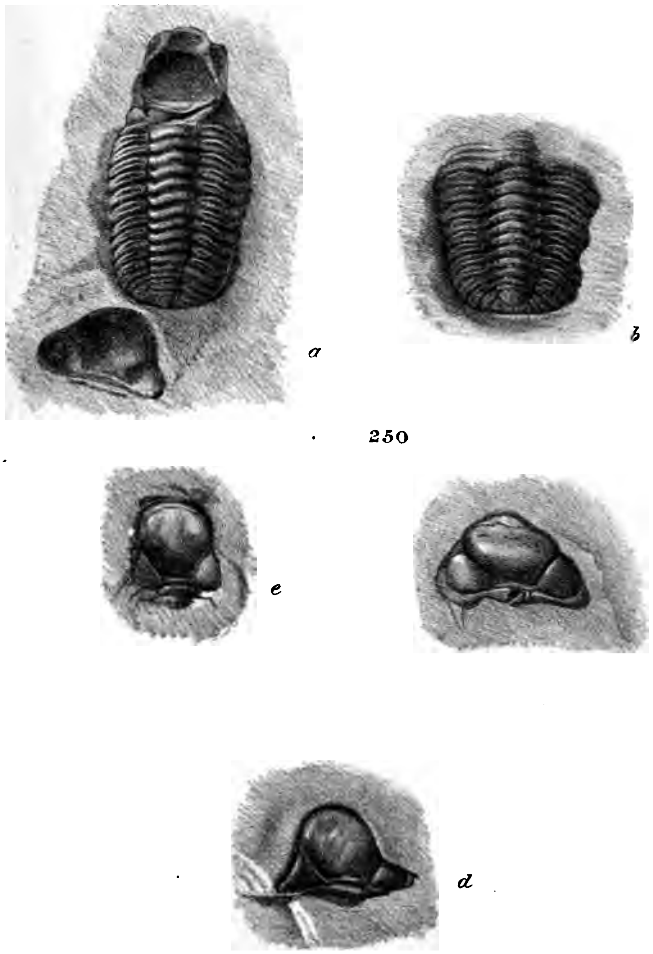

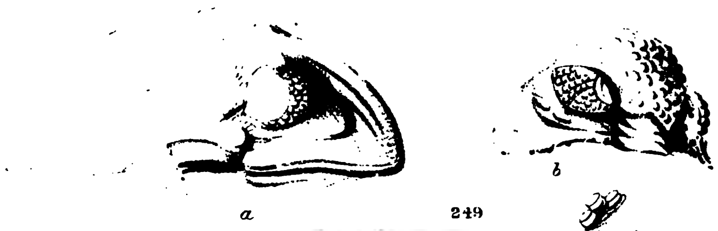

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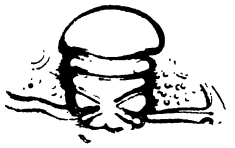

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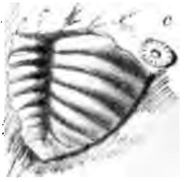

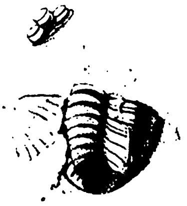

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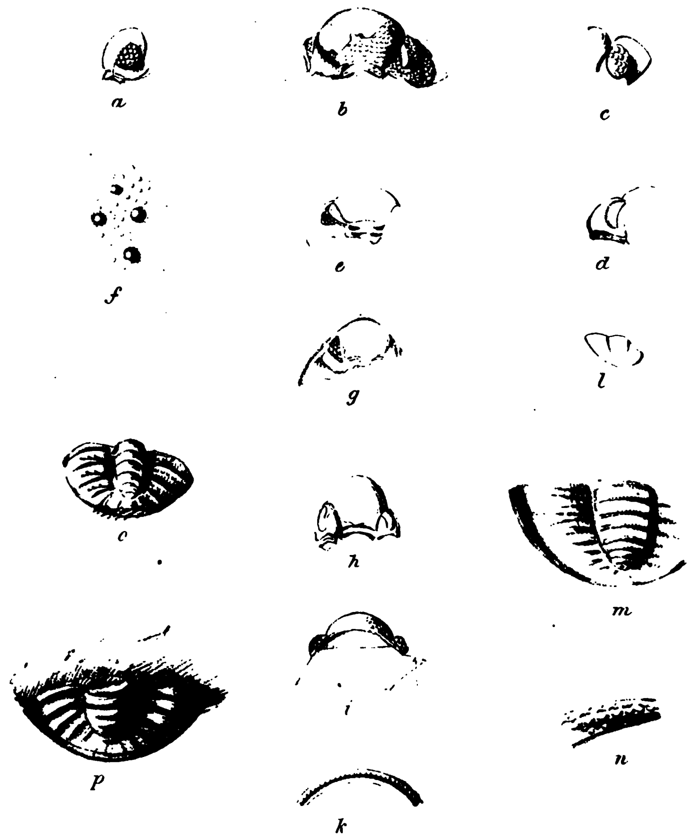

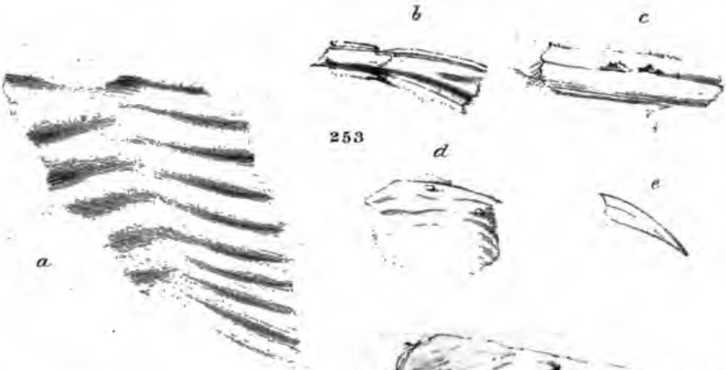
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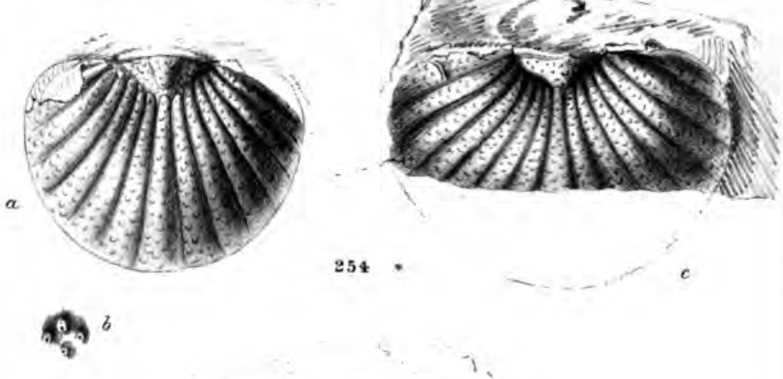
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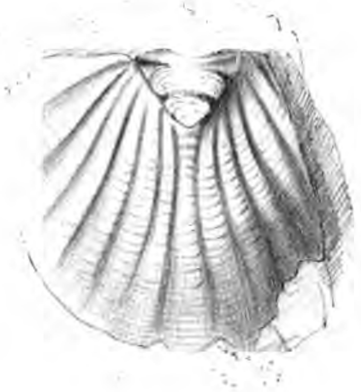
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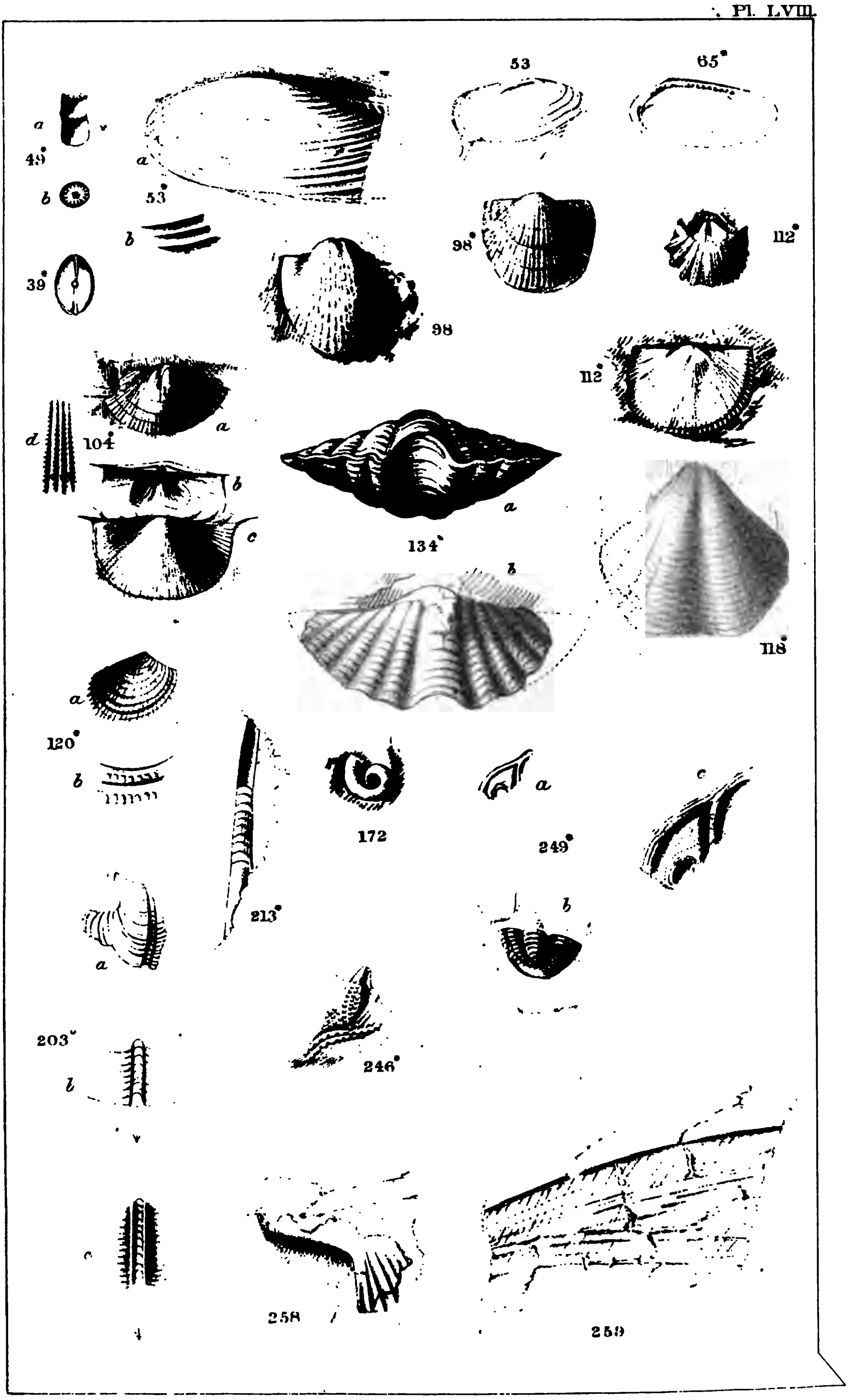
Pl. LVIII.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249*
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a
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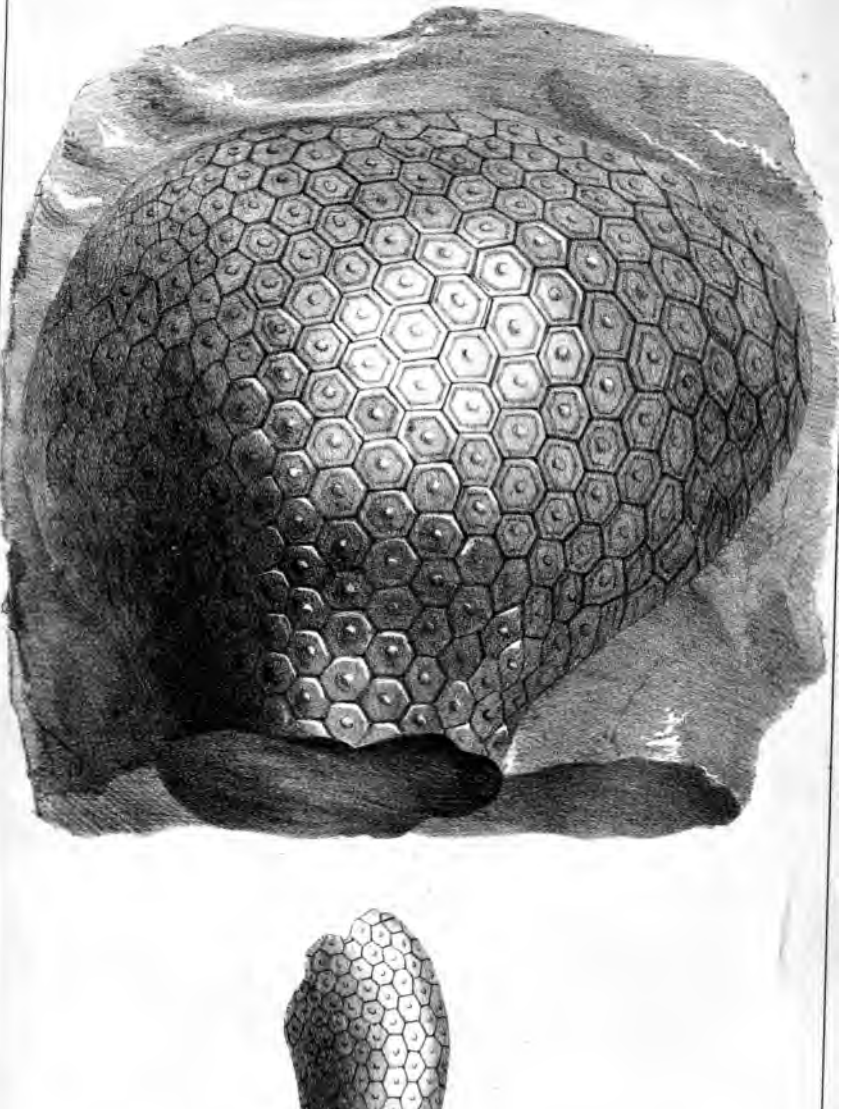
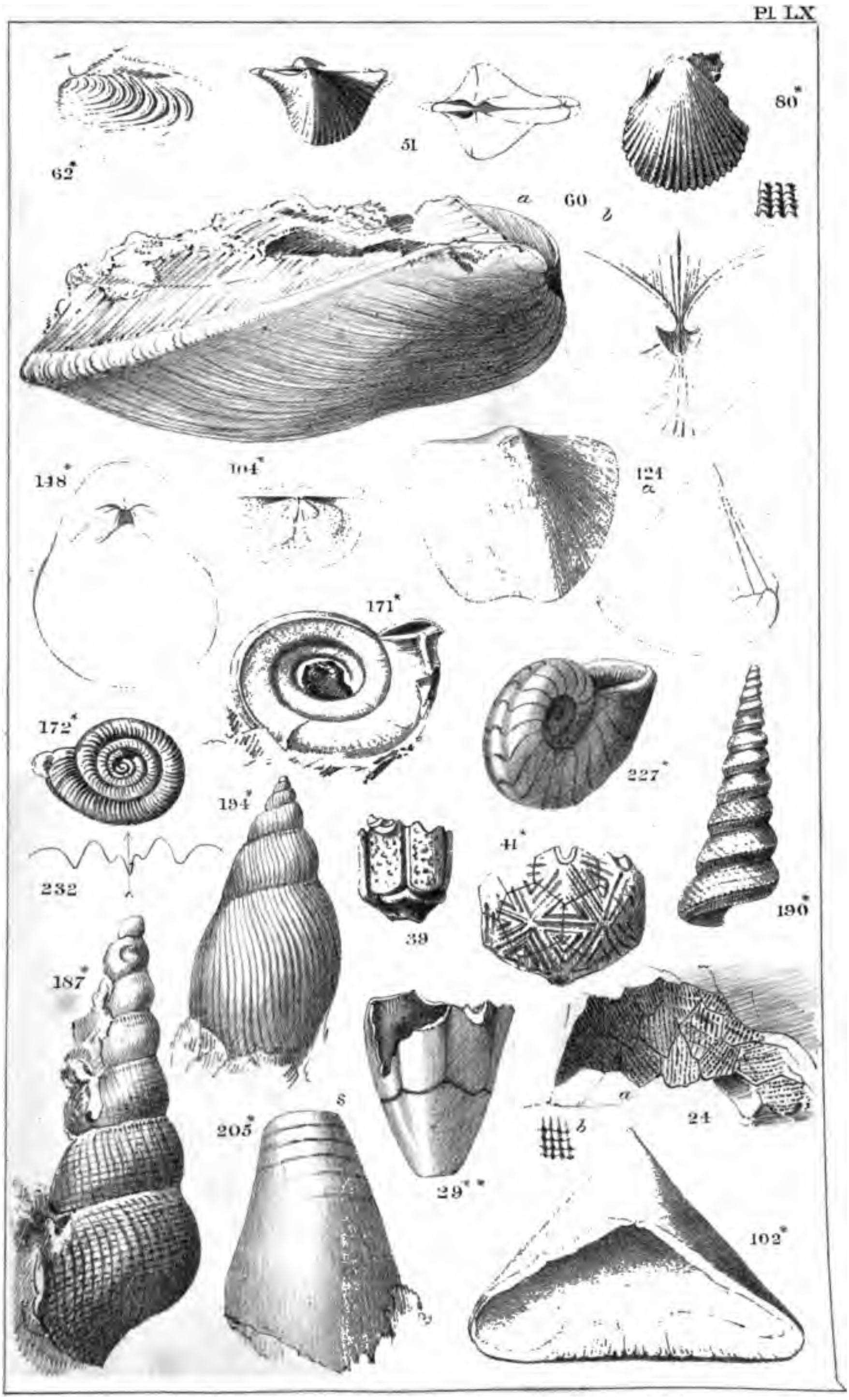
203*
b
246*
c
258
259

Pl. LIX



Pl. LX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124
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